the OIL AND GAS JOURNAL

OCTOBER 22, 1956

DRILLING:

Offshore disputed area resumes drilling p. 70

New methods control lost circulation p. 121

PRODUCTION:

Big lift for deep-well pumping p. 104

EXPLORATION:

Wartime mines plague Libyan oil hunters p. 86

REFINING:

Gas chromatography: speedy new tool p. 62

Planning and executing a turnaround p. 100

Complete table of contents and article digests on pages 2 - 3

24 hours a day, 7 days a week— TIMKEN® bearings take heavy shock loads on this fluid injection pump

USED for oil recovery, this Ajax Triplex pressure pump runs unattended 'round the clock, seven days a week. That calls for dependable performance. And that's why Ajax mounts the crankshaft on Timken® tapered roller bearings.

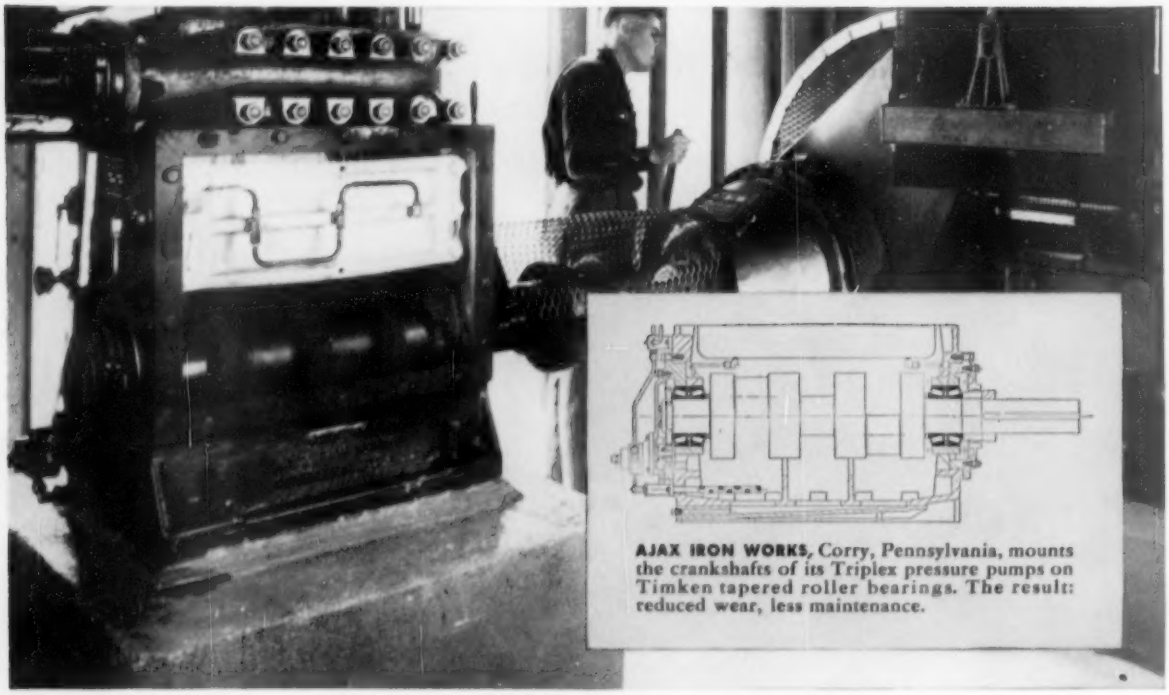
Because Timken bearings are tapered, they take both radial and thrust loads in any combination. And the heavy shock loads imposed on the crankshaft bearings present no problems either. That's because the rollers and races of Timken bearings are case-carburized to provide hard, wear-resistant surfaces over tough, shock-resistant cores.

Full line contact between rollers and races gives Timken bearings extra load-carrying capacity. The crankshaft is held in positive alignment. Wear on adjacent parts is minimized. And Timken bearings keep housings and crankshaft concentric, making closures more effective. Lubricant stays in, dirt stays out.

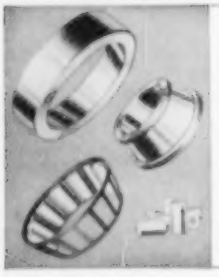
Timken bearings are designed to roll true, and they're precision manufactured to conform to their design. You can be doubly sure of Timken bearing quality because we make them from fine alloy steel, produced in our own steel mill. No other American bearing manufacturer takes this *extra* quality control step.

Specify Timken bearings for the machinery you build or buy. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best



AJAX IRON WORKS, Corry, Pennsylvania, mounts the crankshafts of its Triplex pressure pumps on Timken tapered roller bearings. The result: reduced wear, less maintenance.



DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST —◫— LOADS OR ANY COMBINATION —✳—

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

The Venezuelan Government is concerned over the number of obvious promotion schemes that have cropped up in its first new concession sales in 11 years.

The government earlier served notice that it would not tolerate bids by companies whose sole purpose was to turn the coveted blocks at a profit without any intention of drilling themselves.

It invited new companies to compete, but finds itself holding up two grants involving several million dollars until bidders can be investigated. One such company was known to have made a multimillion-dollar offer without sufficient capital resources of its own, then tried to line up backing from major U. S. companies. The upshot may be sizable deposits of earnest money in advance, which the petroleum commission may demand if it sees fit.

Use of mass spectrometers for process monitoring should pick up sharply. Long a workhorse in the laboratory, this versatile analytical tool is proving its worth in such oil-processing applications as sulfur recovery and selective absorption.

The spectrometer makes a continuous analysis of the components in gaseous process streams and enables the plant operators to make needed adjustments in the process-control system in a matter of minutes.

The idea of publicly posted L.P.G. prices is gaining support, especially on the Gulf Coast.

Some of the big industrial buyers believe posted prices would help stabilize the market, to the mutual benefit of buyer and seller. They complain that unrealistic market reporting sometimes has the effect of setting prices rather than reflecting them.

Look for some highly interesting reports on radiation chemistry from petroleum research laboratories in the next year. They will be bench-scale studies and still remote from commercial application, but they will shed a lot of light on what might be done with this new source of energy. A particularly interesting facet of this work is the possibility of improving catalysts by atomic radiation.

Colorado's oil-in-place formula for figuring allowables in Adena field has taken a beating, but there's still life in the idea.

It was shelved for the most part when the last big operator joined the unit (The Oil and Gas Journal, October 15, page 95). But oil-in-place still will be used to figure payments for a few small royalty owners who have not signed the unit agreement.

Proponents of the formula still claim it is the fairest method of dividing a field's allowable production. They also predict the idea may find future use in fields where sufficient engineering information on each well is available.

Imbibition of water into oil-saturated cores appears to be the best way to tell how a reservoir will react to water flooding.

Recent tests show that rock wettability is the most sensitive factor in results from water flooding, and imbibition shows how water-wet the rock is. Strongly water-wet rocks produce little oil after water breakthrough, and the water bypasses oil in the larger pores. Oil-wet rocks produce considerable oil after water breakthrough and water tends to bypass the smaller pores.

Water advance in rocks of intermediate wettability is fairly uniform in all sizes of pores and more oil can be obtained at water breakthrough than with either of the other types.

the OIL AND GAS JOURNAL

OCTOBER 22, 1956 • VOLUME 54 • NUMBER 77

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

Kenneth B. Barnes ... Editor
Henry D. Ralph ... Chief Editorial Writer
Ted A. Armstrong ... News Editor
Gerald L. Farrar ... Engineering Editor
Dr. Frank J. Gardner ... Exploration Editor
Paul Reed ... Pipeline Editor
John C. Reidel ... Petrochemical Editor
C. O. Willson ... Consulting Editor
W. L. Nelson ... Technical Editor
Lynn M. Nichols ... Presentation Editor
John C. Casper ... Economics Editor
Neil Williams ... Associate Editor
Norman S. Morrisey ... Drilling-Development Editor
Gene T. Kinney ... Associate Pipeline Editor
R. B. Tuttle ... Equipment Editor
Bill Linville ... Assistant to Presentation Editor
Carl Hoot ... District Editor
Carl J. Lawrence ... District Editor
John C. McCaslin ... District Editor
W. A. Bachman ... District Editor
J. O. Scott ... District Editor
J. C. Bradford ... District Editor
Sara Bangert ... District Editor
LaWanda Turner ... Readership Research
Helen Brown ... Editorial Assistant
Alice Burt ... Editorial Assistant
Aileen Cantrell ... Editorial Assistant
C. Dudley Johnston ... Art Director
Jo Jeanne Speaker ... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160
George H. Weber ... Refining Editor
Paul Swain ... International Editor
Ray G. Gibson ... District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726
Larry Resen ... District Editor
Ed McGhee ... District Editor
Joe Reilly ... District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone STerling 3074
Robert J. Enright ... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722
D. H. Stormont ... District Editor
William T. Smith ... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710
Bertram F. Linz ... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

The Oil and Gas Journal, Published Mondays, copyright 1956, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

IN THE NEWS

Pipelines:

T.G.T. Maps $167,000,000 Expansion Program ... 64
Four Corners-to-Los Angeles Crude Pipeline Proposed ... 74
Pipelines Gain as Carriers of Crude, Products ... 78

Processing:

Chromatography Ready to Move into Process Control ... 62
Tidewater Completes Gas Plant at Associated Refinery ... 64
Grace Acquires Irradiation Process for Polyethylene ... 65
Processing Briefs ... 72
World's Biggest Refinery Units Nearing Completion ... 82
Welsh Fishing Village to Get 100,000-bbl. Esso Plant ... 88

Production:

New Method Promises Recovery Approaching 100 Per Cent ... 66
Record-Length Subsurface Pump Run in Texas Field ... 77
Israel's Heletz Field Extended, Reserves Zooming ... 85

Drilling:

Increased Bit Weight, Pump Horsepower Hike Drilling Rate ... 65
Apco Cracks Ice to Break Offshore Drilling Freeze ... 70
Ocean Drilling Gets Third Offshore Drilling Barge ... 80

General Interest:

Colorado Severance Tax Challenged in New Court Action ... 67
Billion-Dollar Tanker Fleet Studied by Government ... 72
Alabama Trying to Get Into Offshore-Squabble Act ... 74
California Commission Sidesteps Conservation Stand ... 80
Southern Production Approves Sale of Assets to Sinclair ... 82

Exploration:

Alberta Leases Net $14,518,311; Pembina Dominates Sale ... 69
Blackfeet Agree to One-Company Control of Oil Lands ... 71
Geologists Claim Williston Still Oil Hunters' Best Bet ... 77
Majors Sign Venezuelan Farmout; Second Deal Expected ... 84
High-Pressure Gas Stops Drilling at Pakistan's 2 Sylhet ... 85
World War II Land Mines Are Libyan Exploration Hazards ... 86
Guatemala Awards 394,000-acre Concession to Conoco ... 88
Lucky Link ... 169
S.E.G. Abstracts ... 170
Geologists Tour Northwest Anadarko Area ... 174

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY–OPERATION

Pipelining

Turbine-Driven Centrifugals Find Their Place **91**

By A. L. Vaughan

Northern Natural has successfully operated two gas-turbine stations through three winter seasons. Each of these stations consists of four 5,700-hp. gas-fired turbine-driven centrifugal units.

Pipeline Patrol: Centrifugal Compressors Are Flexible **137**

By C. F. Koenig, III, and L. J. Holveck

Centrifugal-compressor characteristics are in many ways tailor-made answers to some of the most difficult problems facing the pipeline industry.

Refining-Processing

Gas and Plant-Stream Analyses in a Hurry **94**

By R. J. Carroll and C. L. McGehee

In Cities Service's Lake Charles refinery the work output has been increased many fold by use of mass spectrometer and infra-red spectrophotometer techniques.

Planning and Executing a Cat-Cracker Turnaround **100**

By J. S. Clarke

Here are concrete ideas for speeding the operation, including the use of a number of labor-saving devices.

On The Job . . . In The Plants **103**

The Foreman's Page **129**

Refiner's Notebook **131**

Questions on Technology **133**

Drilling-Production

California's "Pace-Setter" Rig **98**

By D. H. Stormont

This rig, used by Shell in Strand field, central San Joaquin Valley, has drilled each of three 9,600-ft. wells in 16 days.

Rod-Weight Compensator Helps Deep-Well Pumping **104**

By Ed McGhee

Rod-weight compensators went into commercial use 2 years ago, and the devices seem to be profitable in wells pumping from below 8,000 ft.

Dry-Desiccant Adsorber Removes Water, Hydrocarbons **106**

By E. L. Seale

A dry-desiccant adsorber of new design removes both water and hydrocarbons from gas in the field.

Dynamometer Provides More Pumping Information **113**

By Bob G. Agnew

A new role of the dynamometer in pumping operations is to determine net lift and bottom-hole pressure.

Conditioning Flood Water at Chesney Plant **116**

By Jack P. Powell

The plant provides flood water for the El Dorado Shallow Sand Project, Butler and Greenwood counties, Kansas.

On The Job . . . In The Fields **118**

New Methods Control Lost Circulation **121**

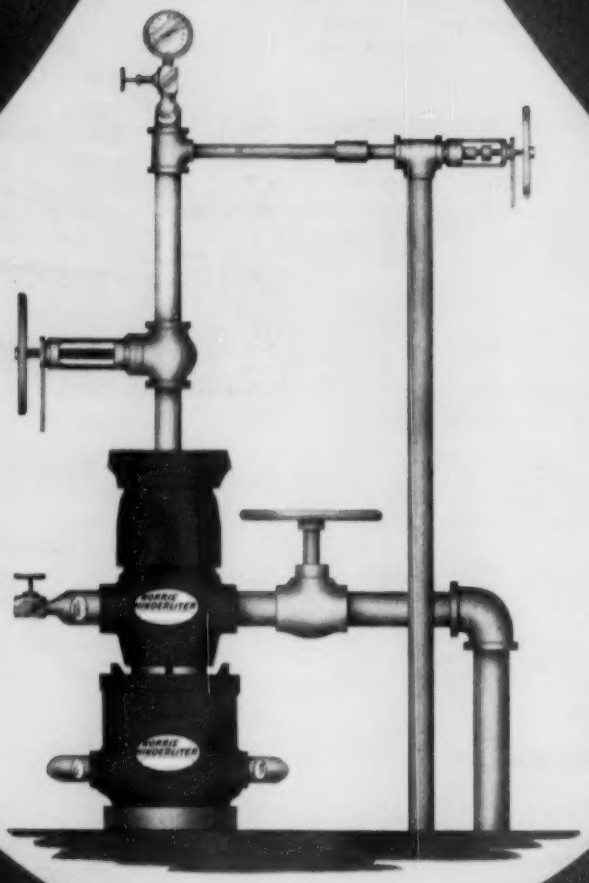
Recognition of the real reasons for loss of mud can lead to better methods for stopping it.

DEPARTMENTS

A Glance Ahead	1	Books	114	Exploration Highlights	169
They Say	46	On the Job . . . In the Fields	118	Personals	191
Calendar of Events	52	Foreman's Page	129	Statistical Summary	195
Journally Speaking	57	Refiner's Notebook	131	Drilling Statistics	196
Editorial	59	Questions on Technology	133	Supply Statistics	197
This Week	61	Pipeline Patrol	137	Refining Statistics	198
Watching Washington	69	Drilling Contractors	141	Markets	199
International News	84	Equipment Digest	145	Classified Advertising	200
On the Job . . . In the Plants	103	Equipment Men in News	161	Advertisers' Index	205

If OIL is Your Business...

You Need NORRIS-HINDERLITER WELL HEAD EQUIPMENT



Your SUPPLY STORE IS OUR DISTRIBUTOR

W.C. NORRIS MANUFACTURER, INC.

TULSA, OKLAHOMA

BRANCHES:

GREAT BEND, KANSAS, CORPUS CHRISTI
HOUSTON, KILGORE, ODESSA, WICHITA FALLS, TEXAS

Since NORRIS 1882

OKLAHOMA CITY, OKLAHOMA
SALEM, ILLINOIS, CASPER, WYOMING

WEST COAST DIST. REPUBLIC SUPPLY CO. OF CALIF., LOS ANGELES

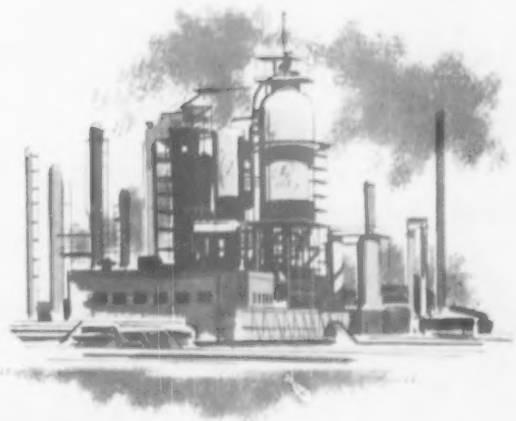
fish

ENGINEERING CORPORATION

HOUSTON, TEXAS

Let FISH be your partner in building for tomorrow

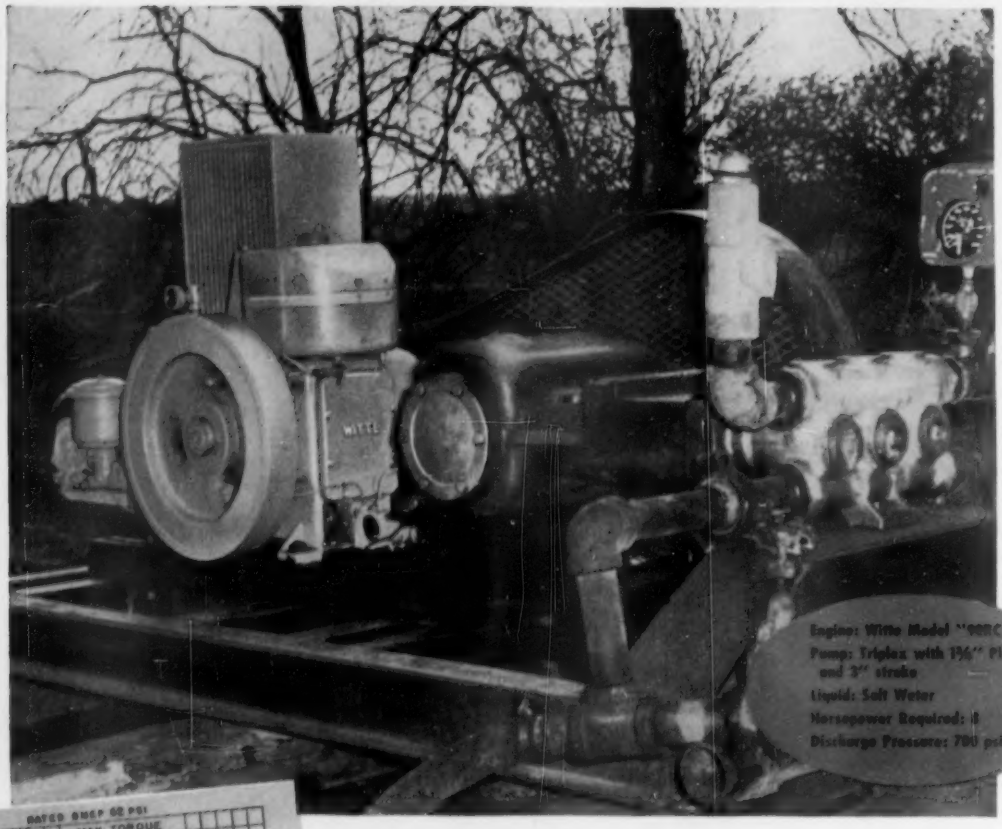
If you are considering new facilities in the oil, gas, chemical or allied industries, you can get valuable assistance from Fish Engineering Corporation and subsidiary companies. At Fish, you will find some of the finest economists, engineers and construction men in the world. They are ready to work with you every step of the way from feasibility studies through engineering, financing, construction and operation.

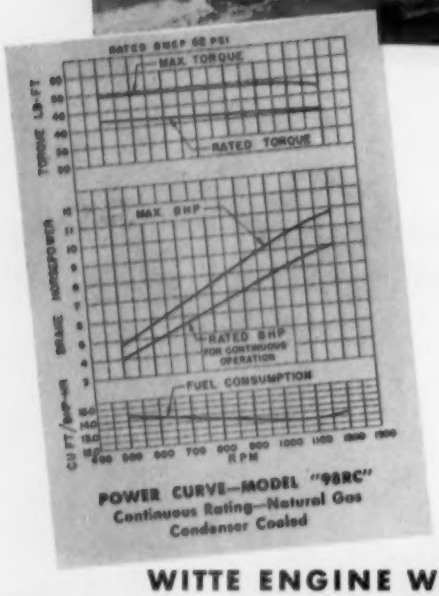


Affiliated Companies

Fish Service & Management Corp.

Fish Northwest Constructors, Inc.


Engine: Witte Model "98RC"
Pump: Triplex with 1½" Plungers and 2" stroke
Liquid: Salt Water
Horsepower Required: 8
Discharge Pressure: 700 psi



POWER CURVE—MODEL "98RC"
Continuous Rating—Natural Gas
Condenser Cooled

You are seeing more and more Witte Engines everywhere . . . doing all kinds of oilfield jobs

WITTE ENGINES were developed for oilfield pumping unit installations . . . and that's where a great majority of them are used. However, the compact solidly built Model "98RC" is being used in a wider range of applications such as operating pumps of various types, fans, compressors, electric-generator units, as well as pumping units.

The "98RC" is the unit you are looking for in the 4 to 10 horsepower range. Buy this engine . . . and other Witte oilfield engines . . . at your favorite supply store.

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION, UNITED STATES STEEL CORPORATION
1608 Oakland Ave., Kansas City 26, Missouri

USS

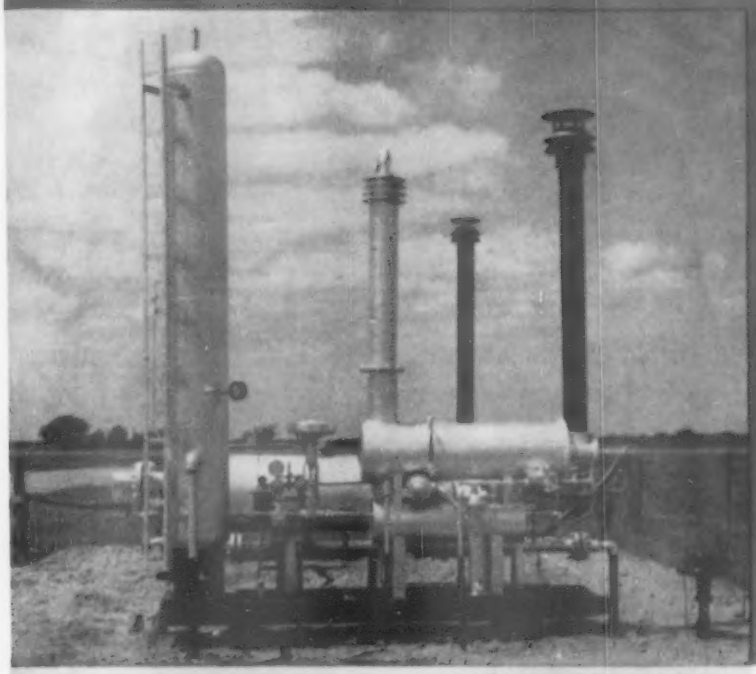
WITTE ENGINES

Gas-gasoline models from 4 to 15.5 hp

Full diesel models from 3.75 to 12.5

UNITED STATES STEEL

Glycol = Flexible Low Cost Gas Drying . . .



M-C =

FINE PACKAGED WELLHEAD GLYCOL TYPE DEHYDRATORS

M-C glycol type dehydrators have many features. They are easy to install . . . the components are skid mounted and all piping is prefabricated and hookup consists of connecting the flow line to the unit . . . units do not depend on maintenance of high well pressures for successful operation . . . dependable pumps and controls reduce required maintenance to a minimum . . . and the units have been especially designed to produce low water dew points with a minimum consumption of glycol.

See a M-C sales engineer about how our units can help solve your dehydration problems.

MALONEY-CRAWFORD TANK & MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma
EXPORT REPRESENTATIVE: Baird Lines, 1037 Grand Central Terminal Building, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd., Edmonton, Alberta
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company, Pampa, Texas

MALONEY-CRAWFORD TANK & MFG. CO.

FASTER! SAFER!

bulk liquids loading and unloading

No. 1749-H

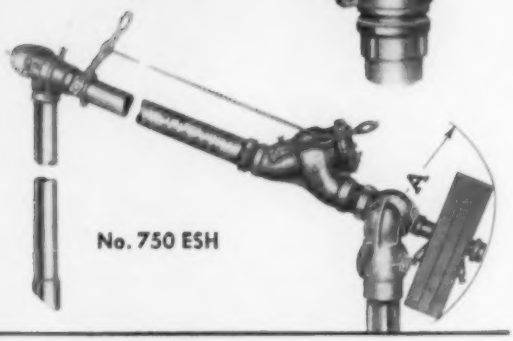
SPRING-BALANCED • COUNTER-BALANCED

OPW loading assemblies

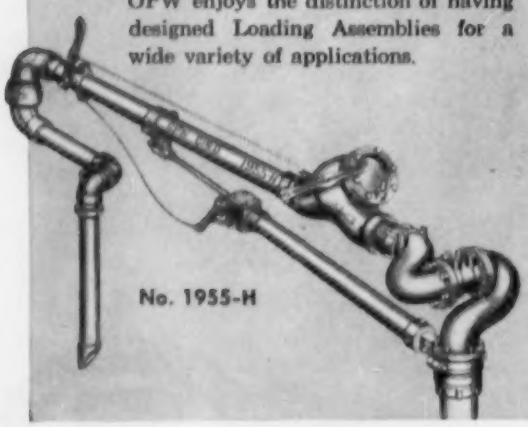
Investigate and realize how OPW's many styles of compact, convenient Loading Assemblies can introduce you to a new fast, economical system for loading and unloading bulk liquids.

FREE CATALOG F-32 provides sizes, engineering data, specifications and details on all OPW Loading Assemblies.

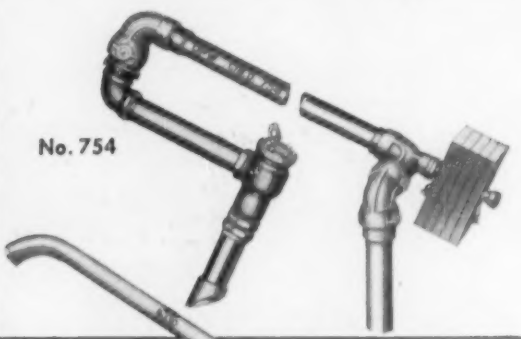
OPW enjoys the distinction of having designed Loading Assemblies for a wide variety of applications.



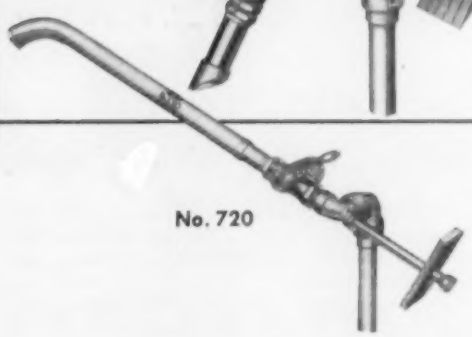
No. 750 ESH



No. 1955-H



No. 754



No. 720

OPW CORPORATION

Valves, Fittings, Assemblies for the Liquids Handling Industries

2731 COLERAIN AVE.
CINCINNATI 25, OHIO

Kirby 1-5400

"AT WESTERN
We don't build the most Heat Exchangers
. . . JUST THE "Best"

E. D. ANDERSON
Manager Heat Exchanger Division
Western Supply Company

Building the best heat exchangers at Western is the result of careful analysis of its facilities and potential as a manufacturer of engineered equipment, designed to fit the exact needs of each individual customer.

Western's modest size, its progressive manufacturing techniques and tools, its highly trained and skilled engineering and plant personnel—all contribute to the end result—the continuing patronage of its customers—new and old.

Realizing that the "best" heat exchanger is the one most accurately rated . . . most skillfully designed . . . most carefully fabricated . . . Western's manufacturing standards are consistently high.

Personal pride in their workmanship characterizes the skilled craftsmen in Western's shops, as well as the technical excellence of the design and engineering staff.

This careful attention to detail and the personal interest in each customer's needs means great savings from trouble-free operation and less maintenance after Western exchangers are installed.

Geared to serve those customers whose needs we best fit, Western will continue its established policy—"building the best heat exchangers".

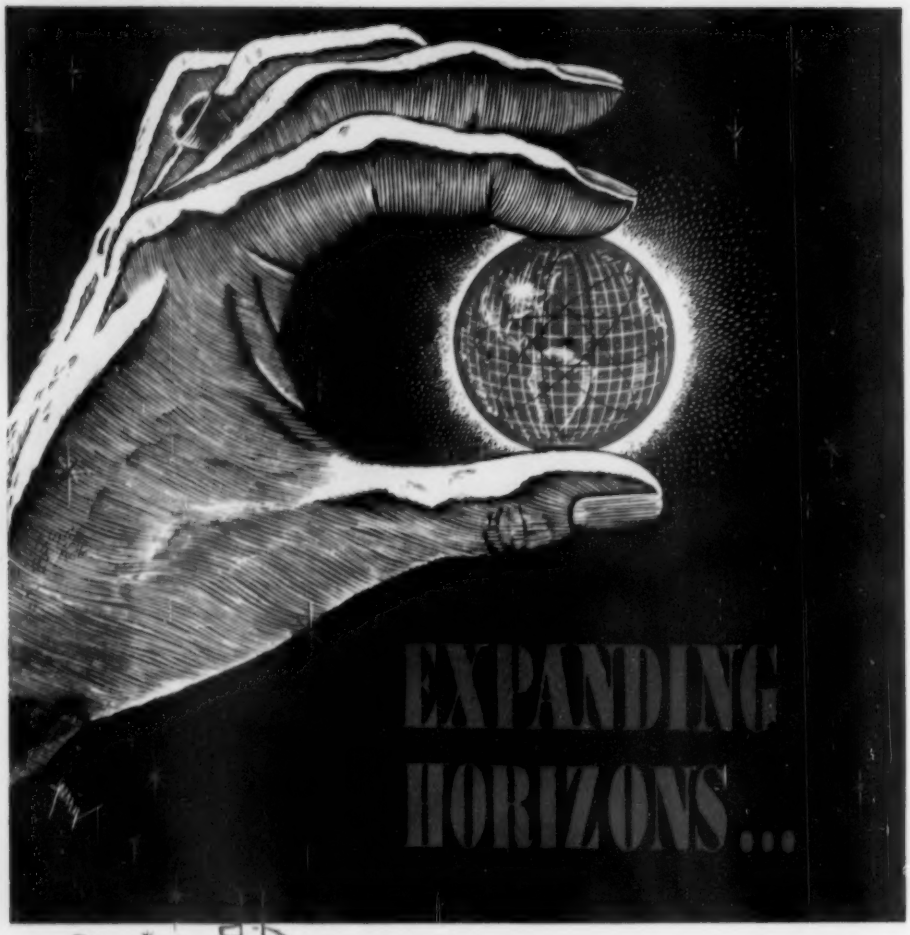
WESTERN
HEAT EXCHANGERS

WESTERN SUPPLY COMPANY
P. O. BOX 1888 • TULSA, OKLAHOMA

HUDSON-RUSH COMPANY — 753 Gladstone Blvd., Shreveport, La.
130 Casa Linda Plaza, Dallas, 18, Tex.
P. O. Box 3151, Amarillo, Tex.

PROCESS INSTRUMENTS & EQUIPMENT CO. — North Bldg., Charleston, W. Va.

H. W. SEVERANCE — 2416 Frankfort Ave., Louisville, Ky.



The REFINERY ENGINEERING Company's horizons are greatly expanded. Treco is now in position to offer engineering, design and construction of refineries, chemical plants, ore processing, secondary recovery and gas processing facilities on a world-wide basis.

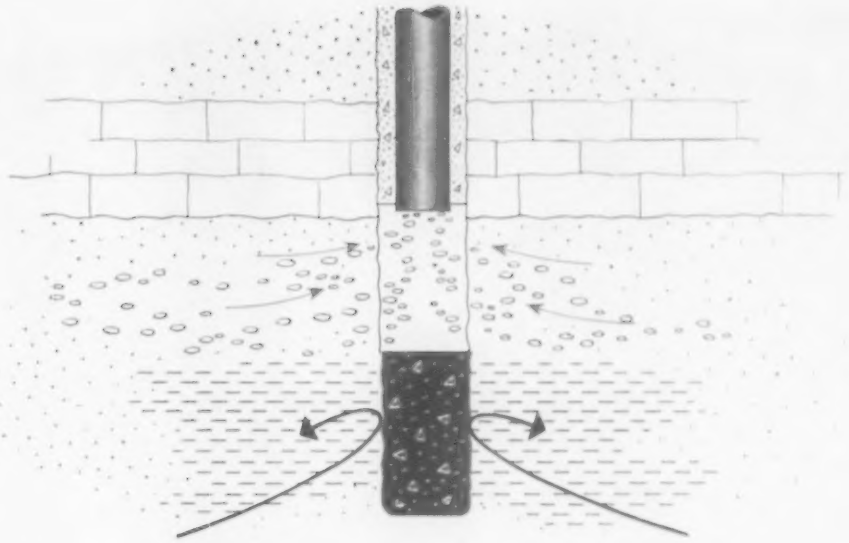
The company has greatly enlarged engineering resources, research and development laboratories and a rapidly expanding staff. This enables The REFINERY ENGINEERING Company to offer a *complete service* to nearly all types of industries.

Treco has just produced a brochure which shows the Company's facilities with photographs of completed projects. A copy will be mailed you promptly upon request on your company's letterhead.

A DIVISION of VITRO CORPORATION of AMERICA

The REFINERY ENGINEERING Company

NEW YORK TULSA TORONTO



water shutoff still your problem?

TRY HALLIBURTON'S DOC

(DIESEL OIL CEMENT)

Getting an effective water shutoff under difficult conditions used to be a costly problem . . . until Halliburton research developed a unique . . . and less expensive answer. It's Halliburton's DOC (Diesel Oil Cement). Squeezing with DOC not only provides a more complete . . . more permanent . . . water shutoff in most wells, it actually cuts cost of doing a better job.

SURFACTANT INCREASES DENSITY

DOC is a suspension of portland cement in diesel oil or kerosene. The addition of a surfactant, known as DOC-1, to the cement-oil slurry gives increased dispersion and suspending qualities to the oil and allows the addition of twice as much cement in a given volume of oil. Halliburton's DOC has unlimited pumping time . . . until it is contacted by water. Then it soaks up formation water like a sponge, producing a set cement of high density, high compressive strength and very low permeability.

COST USUALLY REDUCED

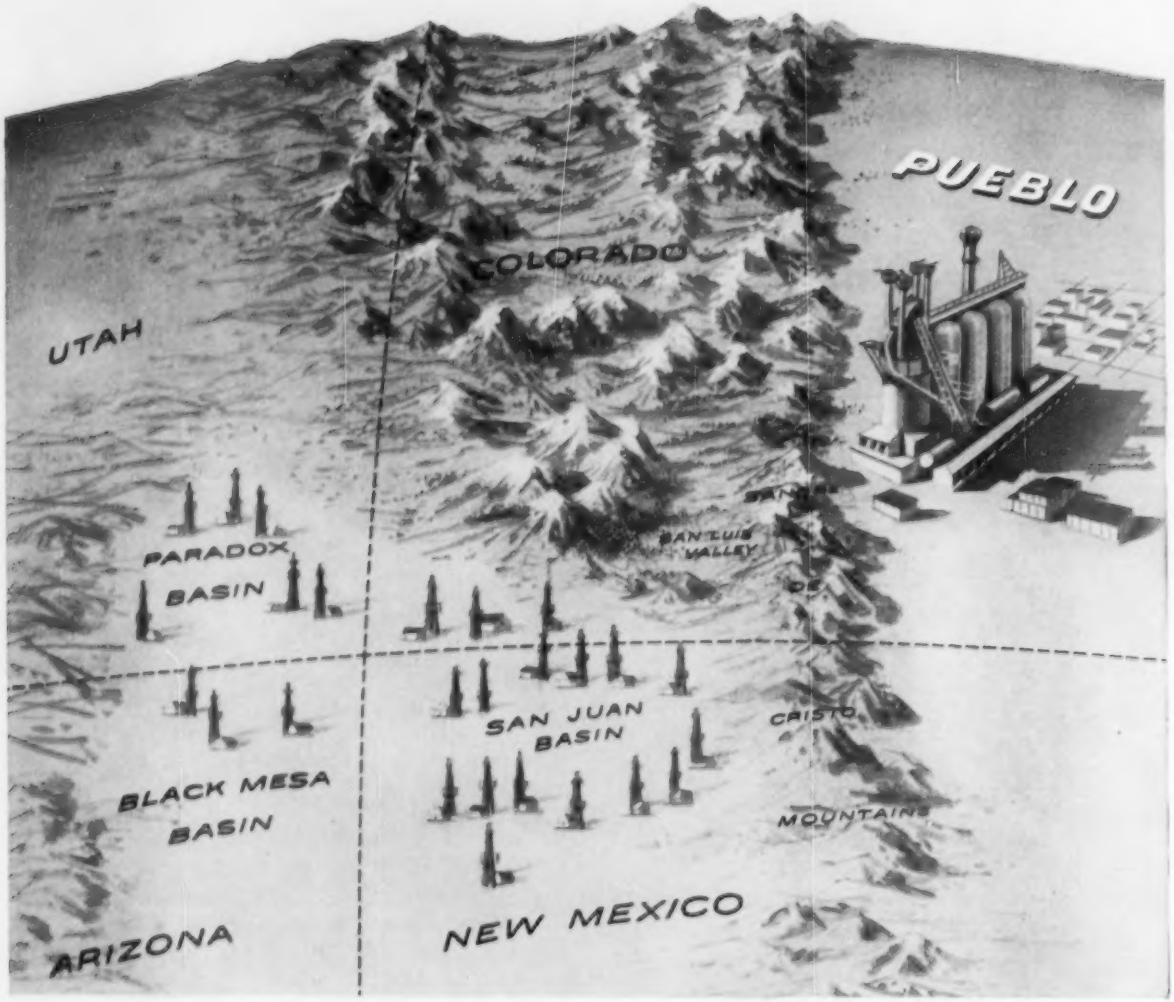
Since, in many jobs, a smaller volume of cement is displaced, costs are substantially reduced. If water shutoff is your problem it will pay you to get complete details about Halliburton's DOC. Just call your local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

COMPLETE DATA SENT ON REQUEST

Get this valuable information for your Halliburton Service File

HALLIBURTON CEMENTING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG



you'll see

CF&I SEAMLESS CASING AND TUBING

throughout the four corners area

Take the San Juan Basin . . . or the Paradox Basin . . . or the Black Mesa Basin . . . or any other active part of the Four Corners Area. There you'll find CF&I Seamless Oil Country Casing and Tubing. For operators all over this important producing and exploration area have found that CF&I's conveniently located Seamless Tube Mill offers them top-quality casing and tubing.

CF&I Seamless Oil Country Casing and Tubing is available in 2⅜" through 9⅝" O.D. It meets or exceeds API STD 5A specification.

4433

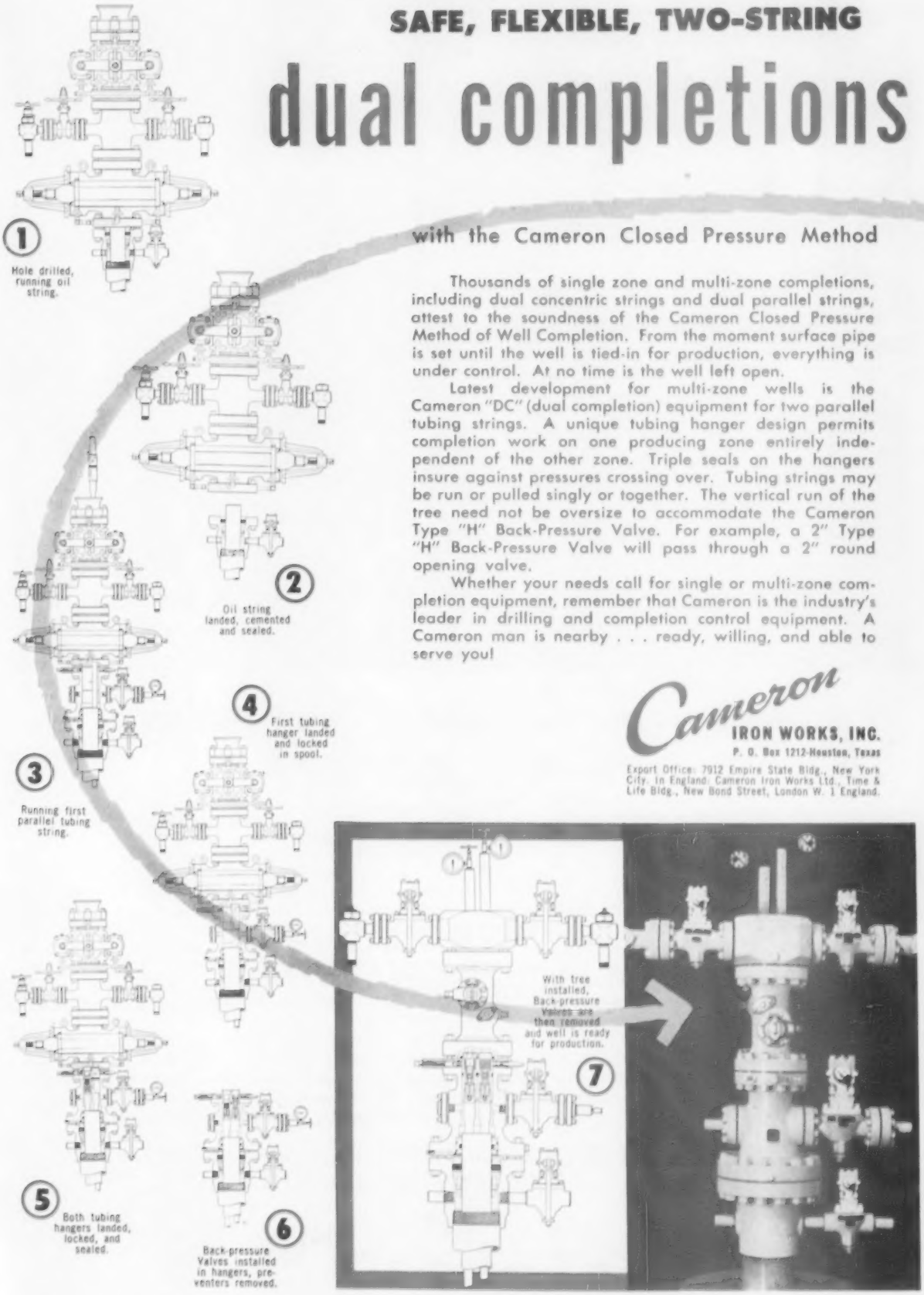
SEAMLESS TUBULAR PRODUCTS
THE COLORADO FUEL AND IRON CORPORATION
Denver, Colorado

CF&I

SAFE, FLEXIBLE, TWO-STRING

dual completions

with the Cameron Closed Pressure Method


1
Hole drilled, running oil string.
2
Oil string landed, cemented and sealed.
3
Running first parallel tubing string.
4
First tubing hanger landed and locked in spool.
5
Both tubing hangers landed, locked, and sealed.
6
Back-pressure Valves installed in hangers, preventers removed.
7
With tree installed, Back-pressure Valves are then removed and well is ready for production.

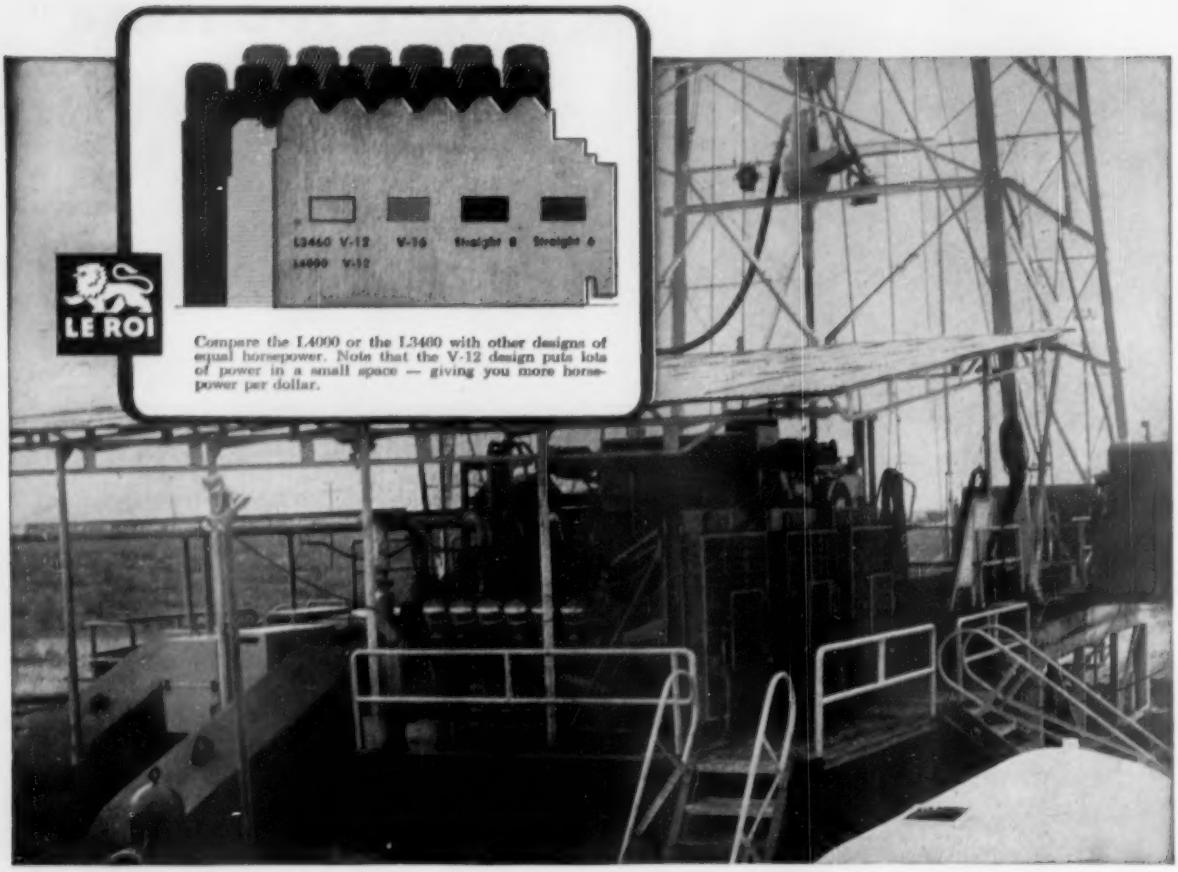
Thousands of single zone and multi-zone completions, including dual concentric strings and dual parallel strings, attest to the soundness of the Cameron Closed Pressure Method of Well Completion. From the moment surface pipe is set until the well is tied-in for production, everything is under control. At no time is the well left open.

Latest development for multi-zone wells is the Cameron "DC" (dual completion) equipment for two parallel tubing strings. A unique tubing hanger design permits completion work on one producing zone entirely independent of the other zone. Triple seals on the hangers insure against pressures crossing over. Tubing strings may be run or pulled singly or together. The vertical run of the tree need not be oversize to accommodate the Cameron Type "H" Back-Pressure Valve. For example, a 2" Type "H" Back-Pressure Valve will pass through a 2" round opening valve.

Whether your needs call for single or multi-zone completion equipment, remember that Cameron is the industry's leader in drilling and completion control equipment. A Cameron man is nearby . . . ready, willing, and able to serve you!

Cameron
IRON WORKS, INC.
P. O. Box 1212-Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.



Compare the L4000 or the L3460 with other designs of equal horsepower. Note that the V-12 design puts lots of power in a small space — giving you more horsepower per dollar.

An engine doesn't have to be BIG to be POWERFUL!

The compact, V-12 design of Le Roi's L4000 and L3460 proves it!

Le Roi's L4000 and L3460 engines represent the first truly new design concept in 15 years. They are compact high-output engines, designed with short stroke to give you greater horsepower and speed without compromising engine life.

In addition to the advantages of short-stroke design, these modern V-12's have lightweight pistons, short-radius rotating parts — hydraulic tappets — crankshaft vibration dampener — sensitive controls. That's why they give you hair-trigger response to load demands.

The fuel economy of these engines is good, too. Thanks to advanced-design manifolding, low friction bearings, and low power loss to accessories, they give you rock-bottom fuel consumption.

Yes, big surprises come in small packages. That's especially true of the L4000 and L3460. These engines are conservatively rated to give you plenty of power in reserve. The L4000, for example, provides 655 max. hp. and the L3460, 600 max hp. And they have a wide speed range, too, up to 1350 rpm. That's why these engines are ideally suited to a great many oilfield applications: drilling, pipeline station, generator, gas booster, etc.

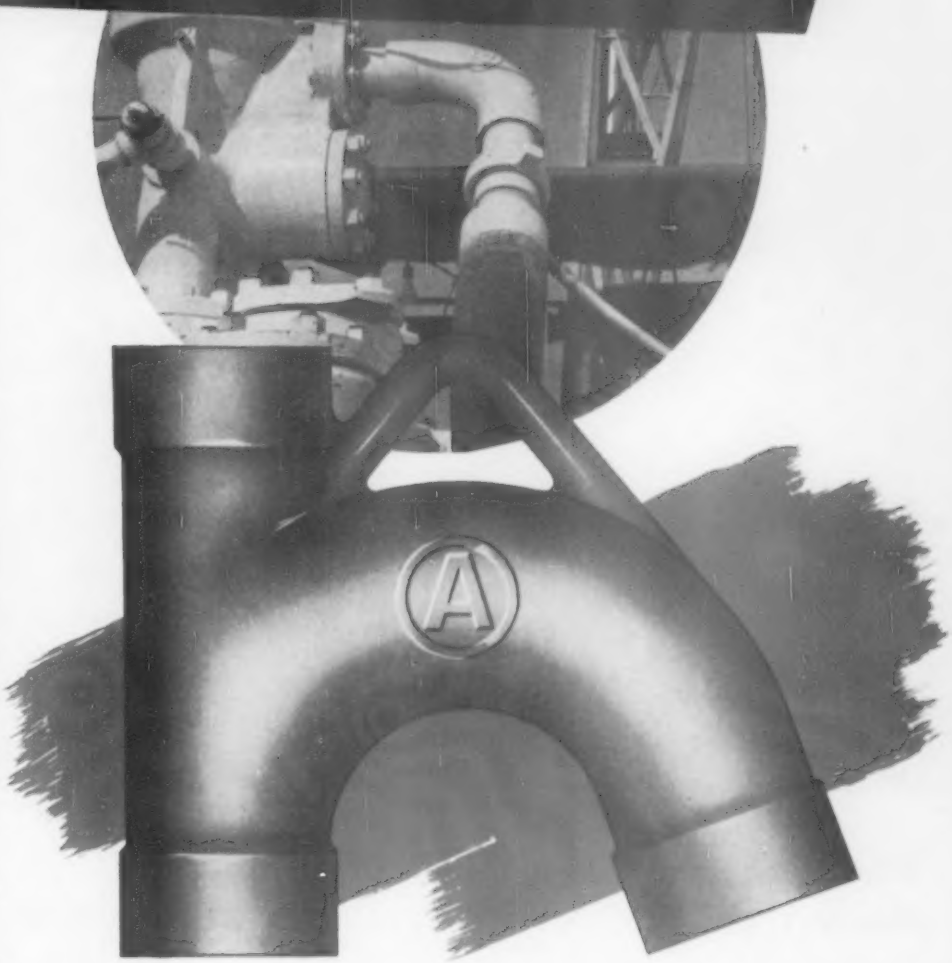
Engines may come bigger than these Le Roi's, but they sure don't come better! See for yourself — ask your supply house or Le Roi distributor to show you an L4000 or L3460 at work. Call him soon. Bulletins are also available — just write for them.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin

PORTABLE AIR COMPRESSORS TRACTAIR STATIONARY AIR COMPRESSORS AIR TOOLS ENGINES

FOR HIGH PRESSURES



AMERICAN IRON STANDPIPE & MANIFOLD FITTINGS

Mudline problems are quickly solved with American Iron fittings available in a variety of versatile designs. Adaptable to manifolds of any construction, these high-test fittings are manufactured in the welded type or with standard threaded connections.

Available Through Your Supply Store

AMERICAN IRON & MACHINE WORKS CO. INC. — MANUFACTURERS OF OIL FIELD EQUIPMENT — OKLAHOMA CITY

Another AMF Product — PETROLEUM EQUIPMENT

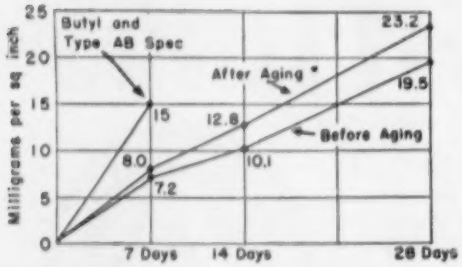
AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

Amazing moisture resistance of Anaconda's Type AB butyl high-voltage insulation helps reduce failure due to moisture.

When you can't keep cable out of moisture

New insulation keeps moisture out of cable

Exceptional moisture resistance is provided by Anaconda Type AB butyl insulation.



RESULTS OF mechanical moisture absorption test show Type AB retains good moisture resistance even after aging.

Where rubber-type cable is installed in underground ducts or buried directly in the earth, the moisture-resistance properties of the *insulation* are vitally important.

Latest facts show *Anaconda's Type AB butyl high-voltage insulation absorbs far less moisture* than industry standards permit. For the mechanical moisture absorption test, the industry has regarded 15 milligrams increase in weight per square inch of exposed surface, after 7 days' immersion at 70C, as a criterion for satisfactory moisture resistance. Type AB easily meets that requirement — in fact, typical results show it absorbs less than 7.2 mg. in 7 days.

New Engineering Bulletin EB-27 gives you full details on performance of Type AB insulation in 15 Industry Specification tests. Ask the Man from Anaconda for your copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

36296

Get all the facts on Anaconda butyl. Write today —

ASK THE MAN FROM ANACONDA®

—PIONEER IN BUTYL INSULATION

Keep producing wells productive with Cronox corrosion inhibitors

Write today for the new booklet, "Aquaness—producers of chemicals for the oil industry".

Every time you pull tubing or halt a pump to repair corrosion damage, you lose money. Cronox corrosion inhibitors . . . and thorough, interested service by your Aquaness field representative . . . can help you save a hefty portion of this maintenance expense.

Cronox corrosion inhibitors put a tough, microscopic film on metal surfaces. Low dosages at periodic intervals keep the film intact, prolong equipment life.

Aquaness field men know how to cope with troublesome wells. They'll see to it that you get the best protection that chemical research and extensive field experience can provide. You'll profit by the completeness of their service.

Don't wait until corrosion starts nibbling into your profits. Have the Aquaness representative in your area start your corrosion control program right now.

Aquaness
Department
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas

These Smoother Running V-Belts Lower Your Operating Costs

Condor V-Belt engineering makes the difference. The strength member is micropositioned in heat dissipating rubber for a smoother running, cooler running drive . . . for longer life with the heaviest power loads. Condor V-Belt sidewalls are made *straight* to put positive pressure on the sheave grooves for more grip . . . less slip. Straight sidewalls help support the super-strength synthetic cords of the belt in a straight line so that *all* cords pull equally . . . deliver their maximum share of power. Controlled length is accomplished through pre-stretching during manufacture to remove inelastic stretch that might otherwise occur on the job.

NOW . . . Moisture-Proof Vacuum Packaging

R/M's exclusive new vacuum sealed moisture-proof packaging assures positive V-belt length control for users of longer lengths in C, D & E cross sections! Belts are measured at the factory under controlled humidity and identified for precise matching. They are then vacuum-sealed in moisture-proof aluminum lined bags. The result — no shinkage or elongation in storage . . . sustained uniformity on the drive! Length is *certified* from the factory to the field.

RAY-MAN CBL ROTARY HOSE

Write for Bulletin #6743, which tells you how you can get the highest safety factor, longest life and lowest cost per foot drilled . . . with Ray-Man CBL Rotary Hose.

R/M *Poly-V® Drive*

Bulletin #6638 describes how flat belt simplicity *plus* V-groove grip permits up to 50% more power delivery with R/M Poly-V*Drive . . . R/M's totally new concept of heavy-duty power transmission. Write for a copy . . . or contact your R/M representative.

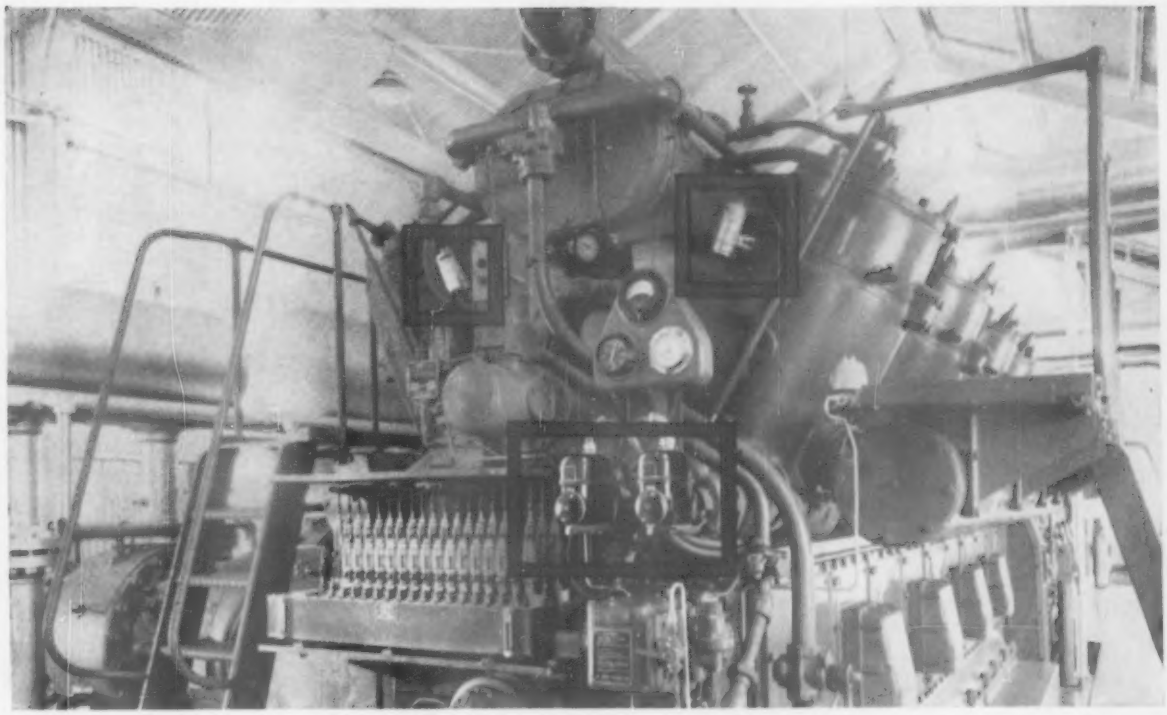
*Poly-V is a registered Raybestos-Manhattan trade-mark

RM 605-O

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls



On the Job in the Oil Fields

Cooper-Bessemer Engine and BENDIX MAGNETOS!

A MATCHED IGNITION SYSTEM
High-V Coil
LAR Magneto
Only one electrical connector, the famous Bendix-Scinflex® type, required for all low-tension outlets.

Continuous reliable engine performance is a must in the great oil fields of the Southwest. Pictured above is a Cooper-Bessemer Model GMVA engine equipped with Bendix® LAR type magnetos and HI-V transformer coils at work in a natural gas transmission pipeline station.

This modern LAR Bendix magneto and its companion high-output coil give the kind of reliable ignition that assures constant efficiency at lower operating costs. Reserve power insures smooth running engines, even under the most adverse operating conditions where marginal systems fall down.

The selection by Cooper-Bessemer of this performance proven, matched ignition system is further proof that Bendix—The Most Trusted Name in Magnetos—is more and more becoming the choice of leading engine builders.

Kits are now available to convert Bendix LA magnetos to the modern LAR type at surprisingly low cost. Complete details are available either from the factory or authorized distributors. ®TRADE MARK

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, SIDNEY, N. Y.

Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.
Canadian Affiliate: Aviation Electric Ltd., 200 Laurentien Blvd., St. Laurent, Montreal 9, Quebec

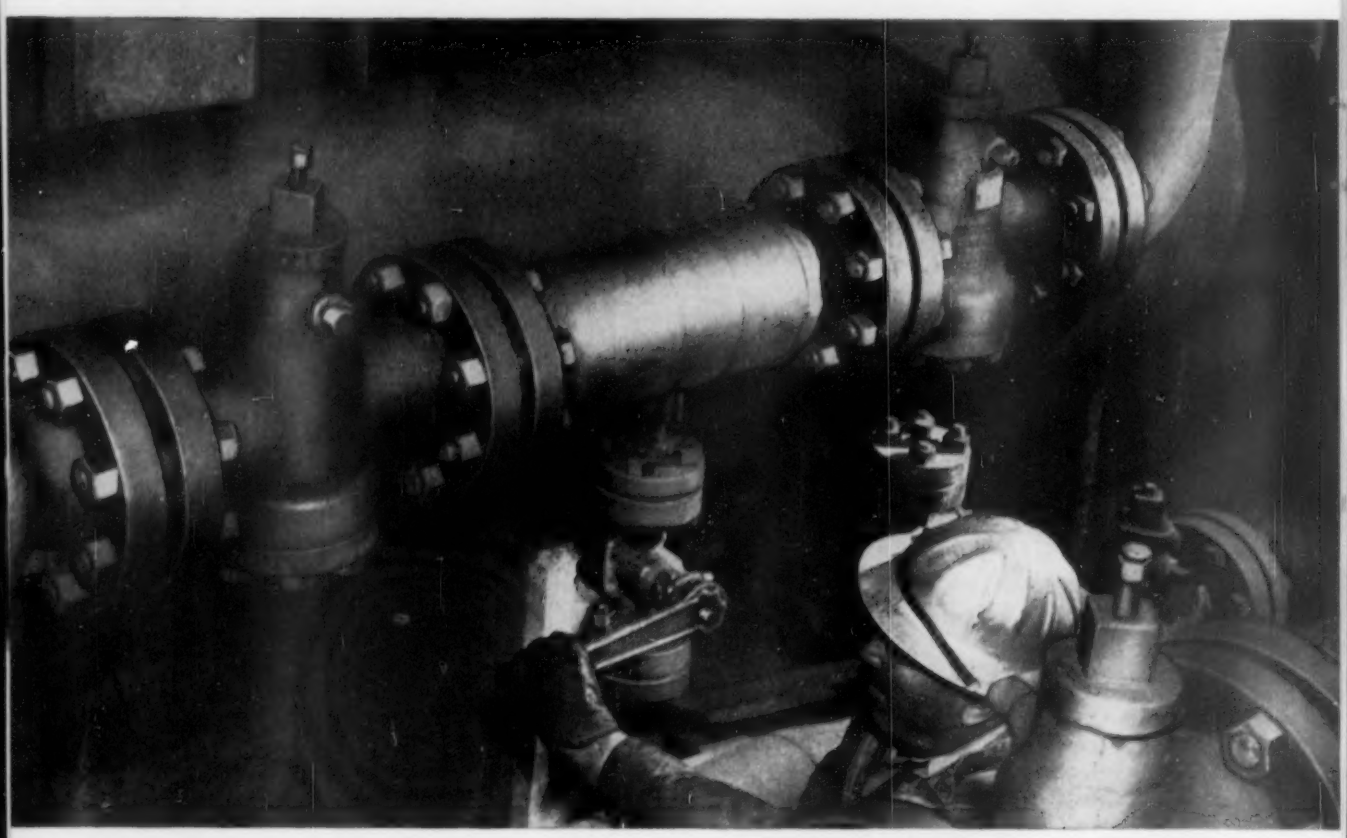
FACTORY BRANCH OFFICES: 117 E. Providencia Avenue, Burbank, California • 512 West Avenue, Jenkintown, Pennsylvania • Paterson Building, 18038 Mack Avenue, Detroit 24, Michigan • 5906 North Port Washington Road, Milwaukee 17, Wisconsin • Hulman Building, 120 West Second Street, Dayton 2, Ohio • 8401 Cedar Springs Road, Dallas 19, Texas • Boeing Field, Seattle 8, Washington • 1701 "K" Street, N. W., Washington 6, D. C.

Bendix
SCINTILLA DIVISION

Bendix
AVIATION CORPORATION

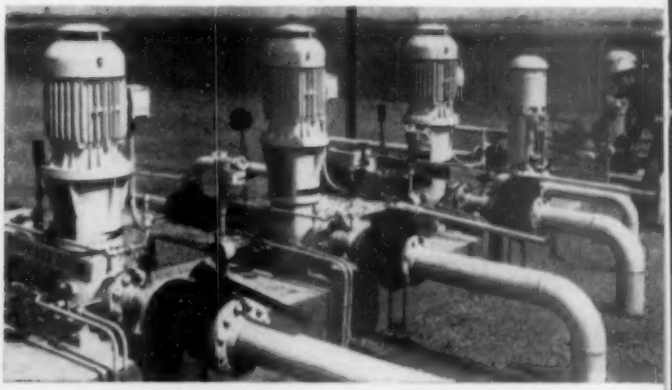
Where There's No

ROCKWELL-Nordstrom



Rockwell-Nordstrom lubricant sealed valves *stay* leakproof in polymerization plant service.

For refinery transfer lines, Rockwell-Nordstrom valves close with fast, easy, quarter-turn operation.



At gasoline plants, Rockwell-Nordstrom valves can't be matched for safety on light hydrocarbon services.

Time For Down-Time

VALVES Perform Better, Longer, For Less Money

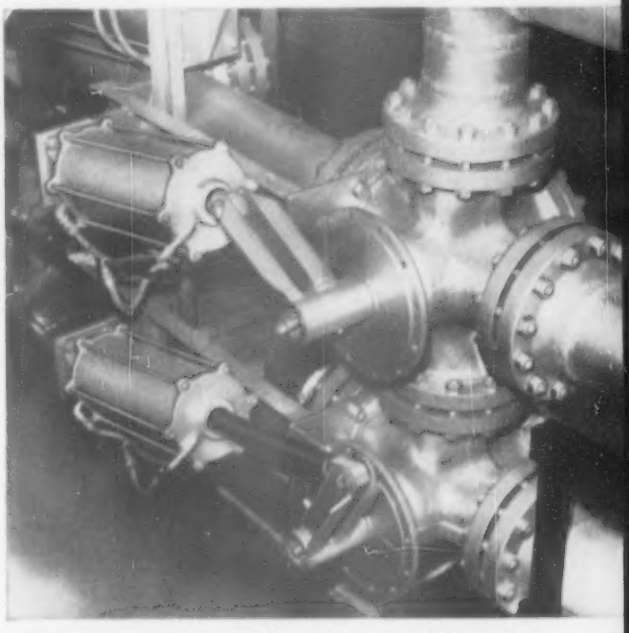
One good way to cut costly down-time in "round-the-clock" process units like refineries and gasoline plants is to use Rockwell-Nordstrom valves. That's why so many oil and gas companies standardize on Rockwell-Nordstrom valves where flow control *must* stay dependable and safe month after month.

The reason for the greater dependability and safety of Rockwell-Nordstrom valves is *pressurized lubricant.* This forms a leakproof seal for tightest shut-off and jacks the plug for fast, easy quarter-turn operation. Lubricant also cuts maintenance costs and adds years to valve life by eliminating grinding metal-to-metal wear.

The original and world's most complete line, Rockwell-Nordstrom lubricated plug valves cost no more to buy—and far less to use—than any other valve. Available in WOG ratings to 10,000 lb. and sizes to 30 x 34" in steel, stainless, semi-steel and corrosion resisting metals. Write for more details: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

Rockwell-Nordstrom valves on cooling tower water lines operate two to five times faster than ordinary valves.

Rugged design and unexposed seating in Rockwell-Nordstrom valves prevent pump shock load wear on glycol circulation service.



These air operated 4-way Rockwell-Nordstrom Multiport valves on cat reformer stills make control of recycle gas lines fast and dependable.

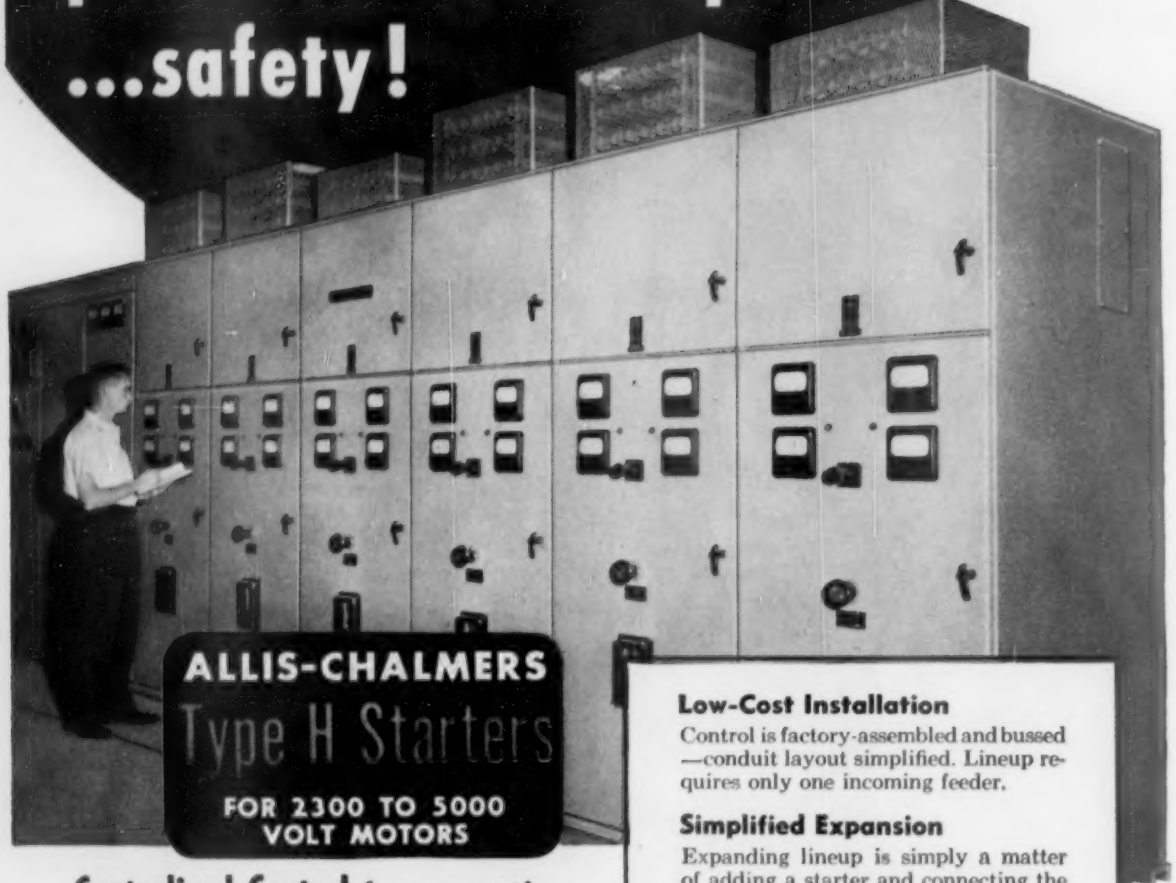
ROCKWELL-Nordstrom VALVES

Lubricant Sealed for Positive Shut-off

40th YEAR *of lubricated plug valve leadership*

You get **MORE** when it's Built by Allis-Chalmers

...more convenience... productive floor space ...safety!



ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

Centralized Control for an entire plant or department

Time-saving, cost-cutting convenience in planning, buying, installation, and operation are all yours with Allis-Chalmers centralized high voltage control. In addition, the factory-assembled lineup, installed in an out-of-the-way location, releases critical floor space for profitable production. From the safety standpoint, the control operates in cleaner atmosphere and can be isolated from unauthorized personnel when located in a separate control room or area.

Low-Cost Installation

Control is factory-assembled and bussed —conduit layout simplified. Lineup requires only one incoming feeder.

Simplified Expansion

Expanding lineup is simply a matter of adding a starter and connecting the bus. Each starter unit is self-contained.

Attractive Appearance

Uniformity of cubicles presents modern, streamlined appearance. Concentrating control in one lineup eliminates cluttered look.

One Company Responsibility

Responsibility for assembling proper devices and for control performance rests with Allis-Chalmers.

For complete information, see your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-4978

McKee expands again to give you

BETTER ENGINEERING AND CONSTRUCTION SERVICES

One of 15 specialized engineering groups in the McKee organization.

THERE are good reasons for the continuous growth of the McKee organization. Because of broad expansion of the industries we serve, our specialized, world-wide services are in greater demand than ever before in our fifty-year history. This demand, in turn, creates unusual opportunities which attract additional engineering and technical experts to the large McKee staff.

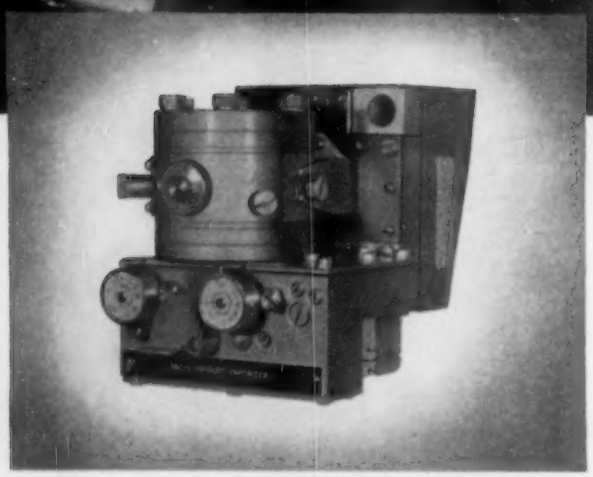
To accommodate our expanded organization McKee added the modern 25,000-square-foot building shown here. Every feature of layout, lighting, air conditioning, sound insulation and efficient equipment was designed with one purpose in mind—to give you better engineering and construction services.

Ideal working conditions contribute to the efficiency of McKee engineers. Private offices and drafting rooms have modern ceiling lighting, air conditioning, floor and ceiling sound insulation and latest engineering equipment.

Arthur G. McKee & Company • Engineers and Contractors
Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
Offices: New York, N. Y. • Union, New Jersey • Washington, D. C.
British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 372 Bay St., Toronto

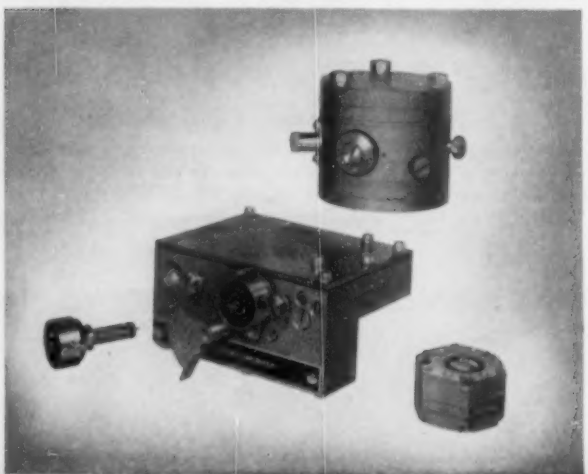
McKee
ENGINEERING & CONSTRUCTION
Services

Quick-connect mounting. Turning a quick-disconnect switch permits removal of controller. Process can then be manually controlled from front of panel.



All adjustments, filters and restrictions are accessible on the face of the controller.

Unitized construction permits easy replacement of all major components.



PROPORTIONAL-PLUS-RESET CONTROL

Tel-O-Set controllers incorporate two pneumatic chambers which receive two transmitted air pressures—one from a measuring unit, the other from a control-point-setting unit. They respond instantly to differences between the two transmitted air pressures by diaphragm movements which adjust the controlled air output to return the controlled variable to its set point.

control any process variable with one **TEL-O-SET** controller

THERE's just one model of the adjustable band *Tel-O-Set* controller . . . and you can use it to control flow, temperature, pressure, or any other variable. It has the speed of response, high sensitivity, and on-the-job versatility to simplify many control problems.

If necessary, you can remove one *Tel-O-Set* controller and replace it with another in a few seconds. Downtime is minimized. Maintenance is simplified. Your spare parts inventory is reduced. And you can easily change processing techniques without buying additional instruments.

Three reset ranges—Tune control action to suit any process with the *Tel-O-Set* controller . . . change the reset range to fast, intermediate, or slow—just by repositioning a single screw.

Compensated rate action—You can easily add rate action to the basic model . . . before the deviation section . . . so that overshoot on batch processes is held to an absolute minimum.

Unitized construction—Each component of the *Tel-O-Set* controller can be replaced with an identical precalibrated component. Needle valves and seats of proportional band and reset adjustments are entirely enclosed and cannot be damaged.

Quick-connect mounting—Mount the *Tel-O-Set* controller on the back of the recorder, on the valve, or anywhere between. A single lever opens or closes all interconnecting air lines . . . allows manual control after the controller is removed. The controller will match up perfectly with the flat, gasketed rear of the recorder.

Made by the world's largest instrument manufacturer, *Tel-O-Set* controllers have demonstrated outstanding performance in countless applications over the years. Call your nearby Honeywell sales engineer for a discussion of how you can profit by their many advantages. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

The rugged acrobats of the oil fields

EMSCO PUMPING UNITS

...triumphs of counter-balance, weight lifting and endurance

Throughout the oil producing areas of the world, you'll find dependable, economical, easy-to-adjust EMSCO Pumping Units doing their job, day after day, month after month, year after year. Due to patented, rotary counter-weights, one man, working at ground level, can quickly, safely and easily adjust them. Precision-cut herringbone gears mounted on a rigid one-piece housing with an automatic positive lubrication system spell long service and economy. There are many sizes and styles of EMSCO Pumping Units for shallow, medium or deep pumping. Call CONTINENTAL today for bulletins and complete details.

EMSCO

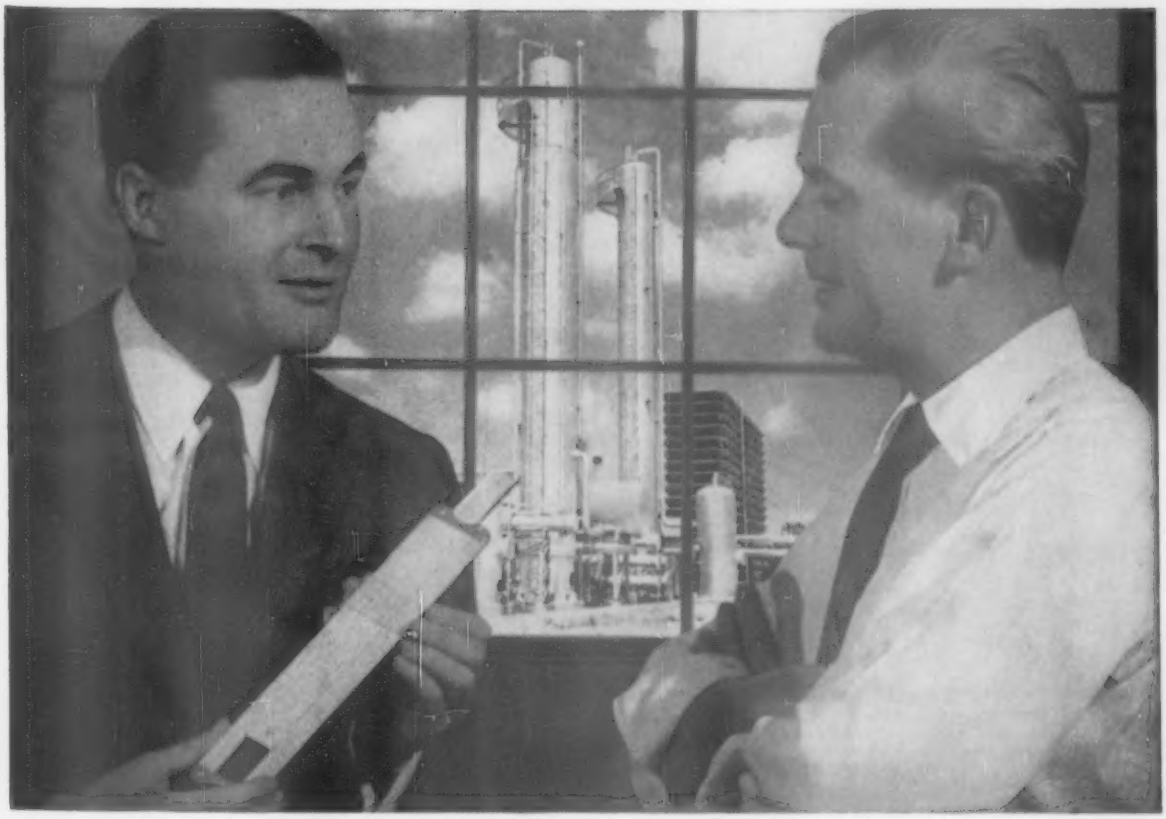
REG. U. S. PAT. OFF.

EMSCO MANUFACTURING COMPANY
Garland, Tex. • LOS ANGELES, CALIF. • Houston, Tex.
General Sales Offices: Dallas, Texas

CONTINENTAL SUPPLY COMPANY
A Division of The Youngstown Sheet and Tube Company
General Offices: Dallas, Texas
Representatives in all principal oil fields of the world

CONTINENTAL
Serving the Oil and Gas Industries

PT-602



You get more than gas treating chemicals from CARBIDE...

CARBIDE's mono- or diethanolamine give you excellent removal of CO_2 and H_2S. By converting the extracted H_2S to sulfur or H_2SO_4, you benefit by recovering a valuable product—thus reducing your operating costs.

CARBIDE's di- or triethylene glycol remove H_2O economically from gas streams. The low initial investment and low operating costs of glycol type plants provide minimum dehydration charges.

Plus Benefits

- Technical data gathered from 22 years experience producing and supplying gas treating chemicals. These data can help you in construction of new facilities, the enlargement of present equipment and in securing trouble free performance of existing plants.
- Technical help from field representatives and service laboratories.
- Fast delivery from warehouses located near major gas fields.
- Constant source of supply.

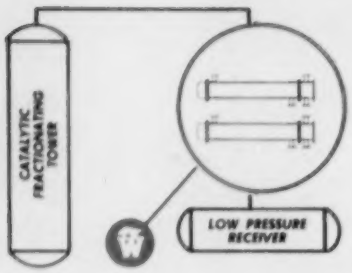
Find out for yourself how CARBIDE can help you. Write today to Carbide and Carbon Chemicals Company, Room 308, Department H, 30 East 42nd Street, New York 17, New York.

In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Montreal. In Western Canada: Harrisons and Crossfield.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

No. 10 in a series to help you achieve greater heat transfer efficiency.



NEW "CAT" FRACTIONATOR OVERHEAD CONDENSERS TUBED WITH WOLVERINE TRUFIN* TYPE S/T CONDENSER TUBE

1

INCREASED EFFICIENCY—Trufin Type S/T is an extended surface tube with its fins an integral part of the tube wall. Because of this, Type S/T has more than two times the heat transfer surface of prime surface tube—extracts more BTU's per foot of tube. Shown here are comparable lengths of tube for equivalent heat transfer surfaces.

2

LOWER COST—Type S/T's additional outside surface area permits the use of less tube for a given heat duty. You get smaller shells, baffles, reduce fabricating costs with lower maintenance because there are less tubes to clean.

3

EASY INSTALLATION—Trufin Type S/T rolls into headers as easily as plain tube—uses the same fabrication methods. Standard rolling-in tools are used. There is no deviation from existing fabrication procedures.

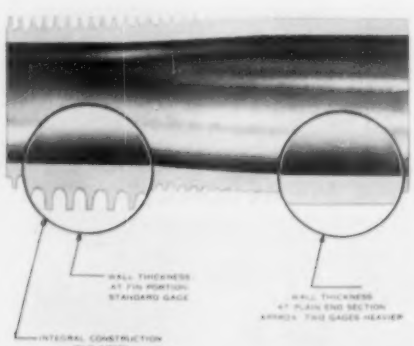
Because of Wolverine Trufin Type S/T condenser tube, new standards of efficiency and economy are daily being established in the field of heat transfer. Diagramed above is another Trufin installation—this time the condensing, for a large Midwest refinery, of hydrocarbon overhead vapors from a catalytic cracking unit fractionating tower.

Illustrated here are four solid reasons why this company specified Trufin Type S/T for the job.

Wolverine Trufin Type S/T will work exactly the same for you as it does for this company. Put it to the test—specify it next time you retube existing equipment or are contemplating the design of new units. Write today for your copy of the Trufin Opportunity Book—it's filled with dramatic case histories and helpful design information.

Wolverine Tube, 1449 Central Ave., Detroit 9, Michigan.

*REG. U.S. PAT. OFF.



4

ENGINEERED FOR THE JOB—Trufin Type S/T is specifically designed for shell and tube applications. The cutaway photograph illustrates its unique, one-piece construction. Because of this, Type S/T gives constant efficiency—its fins are unaffected by thermal shock, vibration or varying pressures.

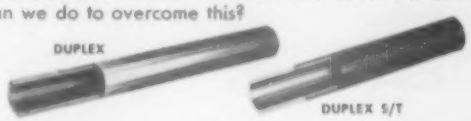
DIVISIONS OF CALUMET & HECLA, INC.
CALUMET DIVISION
WOLVERINE TUBE DIVISION
CANADA VULCANIZER & EQUIPMENT CO., LTD.
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER CO.

WOLVERINE TUBE
Division of Calumet & Hecla, Inc.
Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

You Asked Us

Here are some of the questions which have been answered recently by Wolverine Field Engineering Service. It is active proof of Wolverine Tube's versatility.

Q. We changed our plant operation recently and now we're having severe corrosion problems. On one heat exchanger we have entirely different corrosion conditions on the shell side than we do on the tube side. What can we do to overcome this?



A. ***When two entirely different corrosive conditions are encountered, Wolverine can supply a Duplex tube—one which consists of two tubes of entirely different alloys. Any two metals can be used—the determining factor simply being the type of corrosion encountered. Of course, if you want more surface you can specify Duplex Type S/T condenser tubing. You not only get two different metals but also integral fins to increase the heat transfer surface.***

Q. Recently we used our first installation of Wolverine U-Bend condenser tubes. Can we obtain finned tube in U-Bend form?

A. ***You sure can. Wolverine U-Bends are available in both finned and prime surface condenser tube—pre-arranged to your prints.***

Q. On some jobs we've been using steel condenser tubing and there are a few cases where we'd like to obtain more surface. What do you suggest?

A. ***Actually you're in luck—On the exchangers where you want additional surface you can use Wolverine Trufin Type S/T welded steel condenser tubing. That will give you the additional surface you need.***

Q. Can we use Wolverine Trufin Type S/T condenser tubing at high temperatures?

A. ***Yes. Type S/T is an integral finned tube, as are all other types of Trufin. The fins are squeezed directly from the tube wall— are a part of the tube itself. They cannot shake loose because of thermal shock, vibration or varying pressures. Trufin is also available in bi-metal: high finned aluminum exterior and an inner liner of your choice.***

If you have a question—whether it be about alloys, design or fabrication—bring it to Wolverine. You'll get the right answer and you'll also get exactly the right condenser tube to help you do a better job. Write, too, for your copy of the Wolverine Condenser Tube Catalog. WOLVERINE TUBE, 1449 Central Avenue, Detroit 9, Michigan.

*REG. U.S. PATENT OFFICE

Wolverine Trufin is available in Canada through the Unifin Tube Company, London, Ontario.

DIVISIONS OF CALUMET & HECLA, INC.
CALUMET DIVISION
WOLVERINE TUBE DIVISION
CANADA VULCANIZER & EQUIPMENT CO., LTD.
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER CO.

WOLVERINE TUBE
Division of Calumet & Hecla, Inc.
Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

5561 5010 WS1

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES
EXPORT DEPT., 15 E. 40TH ST., NEW YORK 16, N.Y.

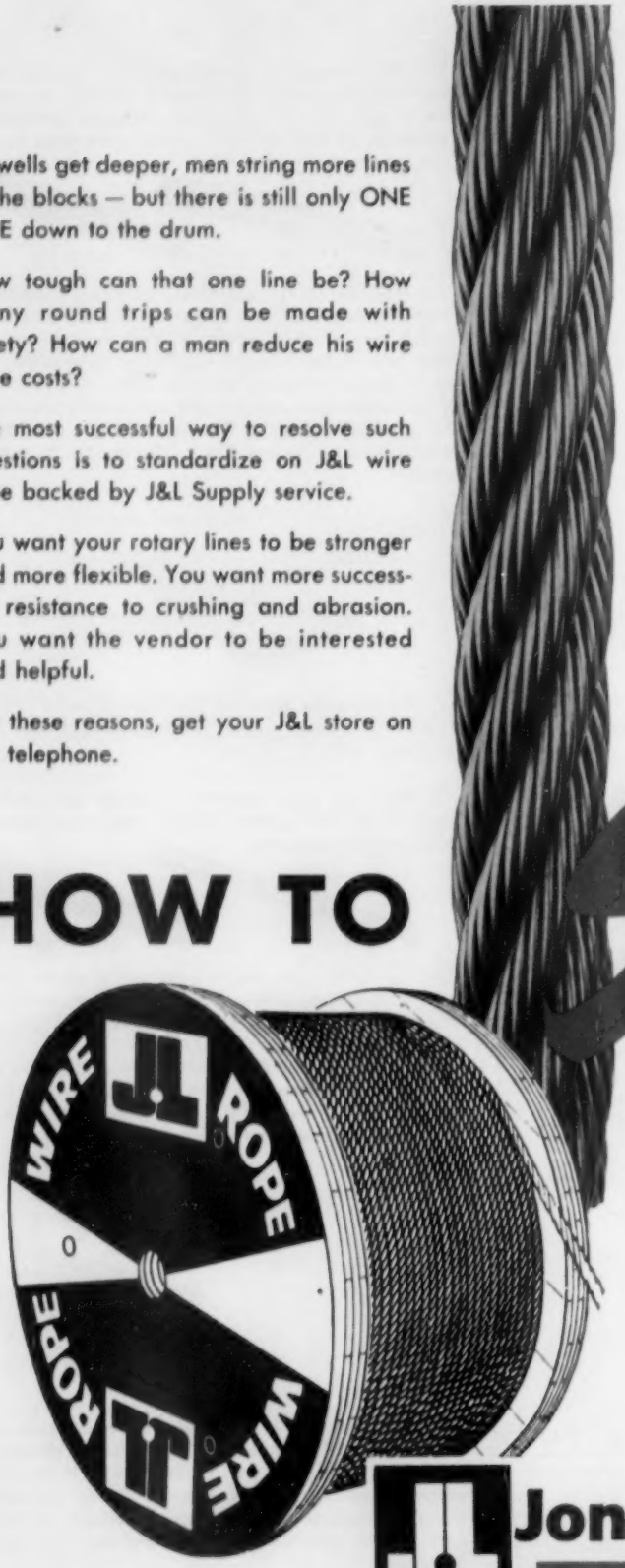
As wells get deeper, men string more lines in the blocks — but there is still only ONE LINE down to the drum.

How tough can that one line be? How many round trips can be made with safety? How can a man reduce his wire rope costs?

The most successful way to resolve such questions is to standardize on J&L wire rope backed by J&L Supply service.

You want your rotary lines to be stronger and more flexible. You want more successful resistance to crushing and abrasion. You want the vendor to be interested and helpful.

For these reasons, get your J&L store on the telephone.



HOW TO *Save*

On Rotary Wire Lines

IWRC — Fiber Core — SpringKore

Jones & Laughlin

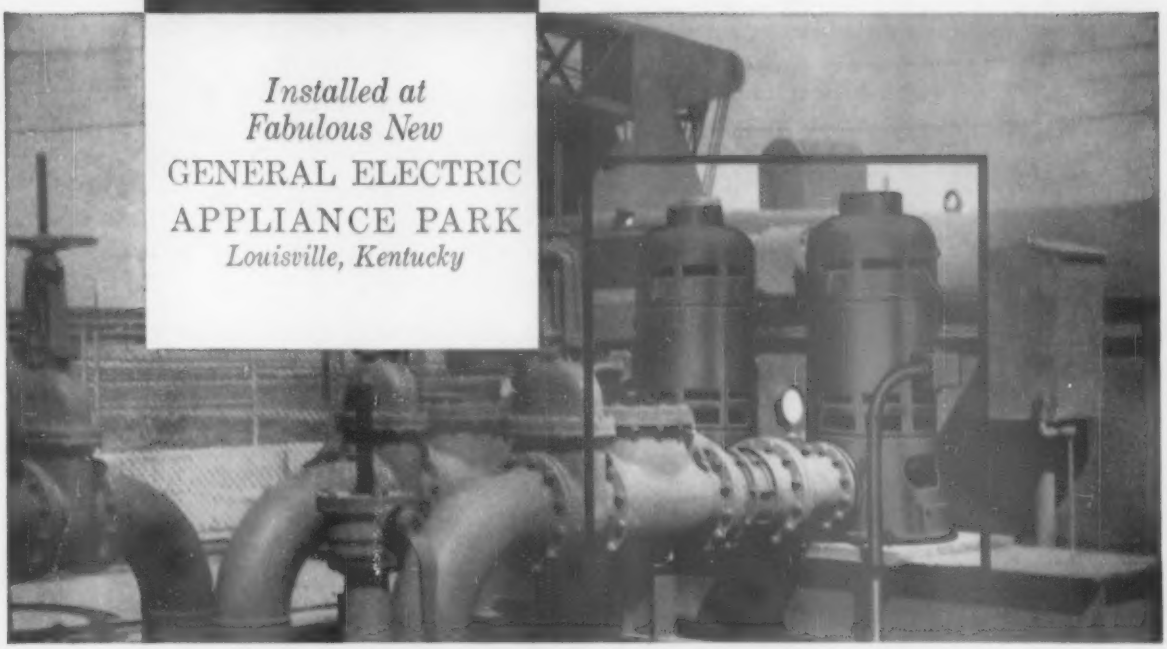
SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

B-G-A

JOHNSTON
Vertical Turbine
PUMPS

Installed at
Fabulous New
GENERAL ELECTRIC
APPLIANCE PARK
Louisville, Kentucky



Comprising a complete industrial city, the new General Electric Appliance Park at Louisville, Kentucky, housed in five huge buildings (another under construction), is nearly a mile wide and a mile and one-half long.

Two Johnston Vertical Turbine Pumps have been installed outdoors on the roof of the mill pond house. Their function is to take water from the mill pond and circulate it through the spray nozzles for cooling purposes, and to provide circulation for the mill pond. These pumps were installed by Johnston's representative Diehl Pump and Supply Co., Inc. of Louisville, Kentucky.

JOHNSTON
PUMP COMPANY
Founded in 1909
Bin "K", Pasadena 15, California

Call or write for colorful Johnston Bulletin.

JOHNSTON
VERTICAL PUMPS

☐ Please send bulletin
☐ Have representative call

Name_____
Address_____
City_____ Zone____ State_____

It's Easy with UNICOR®

TO AVOID CONTAMINATION OF PIPE LINE PRODUCTS

You get complete freedom from product contamination and at the same time economical protection for your pipe line when you use UOP UNICOR.

UNICOR is added only at the points of product entry, is distributed uniformly over the entire internal surface and effects 100% protection.

UNICOR is inexpensive to use, too. Actually, only one or two molecules of UNICOR are required for every 1,000,000 molecules of gasoline. This makes UNICOR's cost only about $0.0005/bbl. of pipe line product. There are additional savings, too, in reduced scraper-cleaning and filter replacement costs.

Our technical staff will be glad to assist you in the design, installation and operation of a UNICOR system of protection. Write us for information and samples.

PRODUCTS DEPARTMENT

UNIVERSAL OIL PRODUCTS COMPANY

UOP®

30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U. S. A.

Stems can't seize...

ALL-IRON TRIM, FIG. 337

BRONZE TRIM FIG. 333

Both of these OIC Duo-Bolt gates have special stems. The Fig. 333 stem is OIC *Alloy-40* in sizes 2" and under . . . corrosion-resistant bronze with 20 to 30 times longer life than most other stem bronzes. It will not gall or seize. In fact, this alloy has all but eliminated stem replacement. The Fig. 337 stem is nickel-plated steel . . . highly resistant to pitting in the packing area, sturdy and long wearing.

Design includes bonnet drain ducts . . . recessed gasket seat

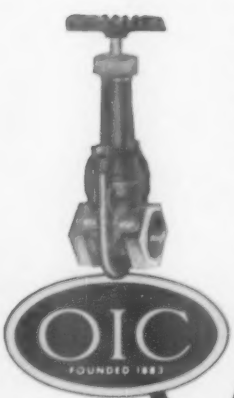
To protect against freezing, bonnet ducts allow complete drainage of the upper part of the valve. The male-female, gasketed body-bonnet connection assures a tight joint and prevents blown gaskets.

Exclusive cast-in seat rings

On sizes 2" and under, bronze trimmed valves include cast-in seat rings, *rolled* to make doubly sure that they cannot loosen in service. On sizes 2½" and larger, seat rings are screwed in. Seats are integral on all-iron trim valves. Both types include a button-head stem-to-wedge connection, flexible for non-binding wedge seating.

Immediate availability . . . long line

Order Duo-Bolt gates from your OIC Distributor or his field store. Sizes: ¼" to 4", screwed or flanged ends. Working pressures: 125 to 150 lbs. WSP, 200 to 225 lbs. cold WOG, non-shock. Request Form No. 1007 for more information.



THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

P-509

Exploration. With the extra traction of its 4-wheel drive, the Universal 'Jeep'* travels remote and rugged lease terrain for prospecting and exploration. In good weather or bad, it takes tools, equipment, geologists, and seismograph crews wherever they need to go.

On the lease...along the pipeline... 'Jeep' vehicles GO "anywhere—anytime"!

Pipeline Construction. The time-tested, performance-proved 4-Wheel-Drive 'Jeep' Truck moves far ahead of roads with the extra traction of its 4-wheel drive—delivers cargo and workers to pipeline construction areas ordinary vehicles can't reach.

Transportation. The rugged Universal 'Jeep' and 4-Wheel-Drive 'Jeep' Utility Wagon take supervisors, crews, tool-pushers and their equipment and supplies almost anywhere, on the road or off—even through water 2 feet deep or up steep inclines.

Every day the oil and gas industry is more and more depending on the unmatched "go-anywhere" ability of 'Jeep' vehicles to get to more places—do more jobs. The extra traction of 'Jeep' vehicles' 4-wheel drive takes them through mud, sand, soft earth, up steep 65% grades—carrying full loads or towing heavy trailers. And they shift easily into conventional 2-wheel drive for highway travel at top legal speeds.

Time-tested and performance-proved 'Jeep' vehicles are the only vehicles in their weight class designed and engineered completely for 4-wheel drive off-the-road use. And only Willys has so many years of experience and know-how in engineering 4-wheel drive vehicles in this weight class.

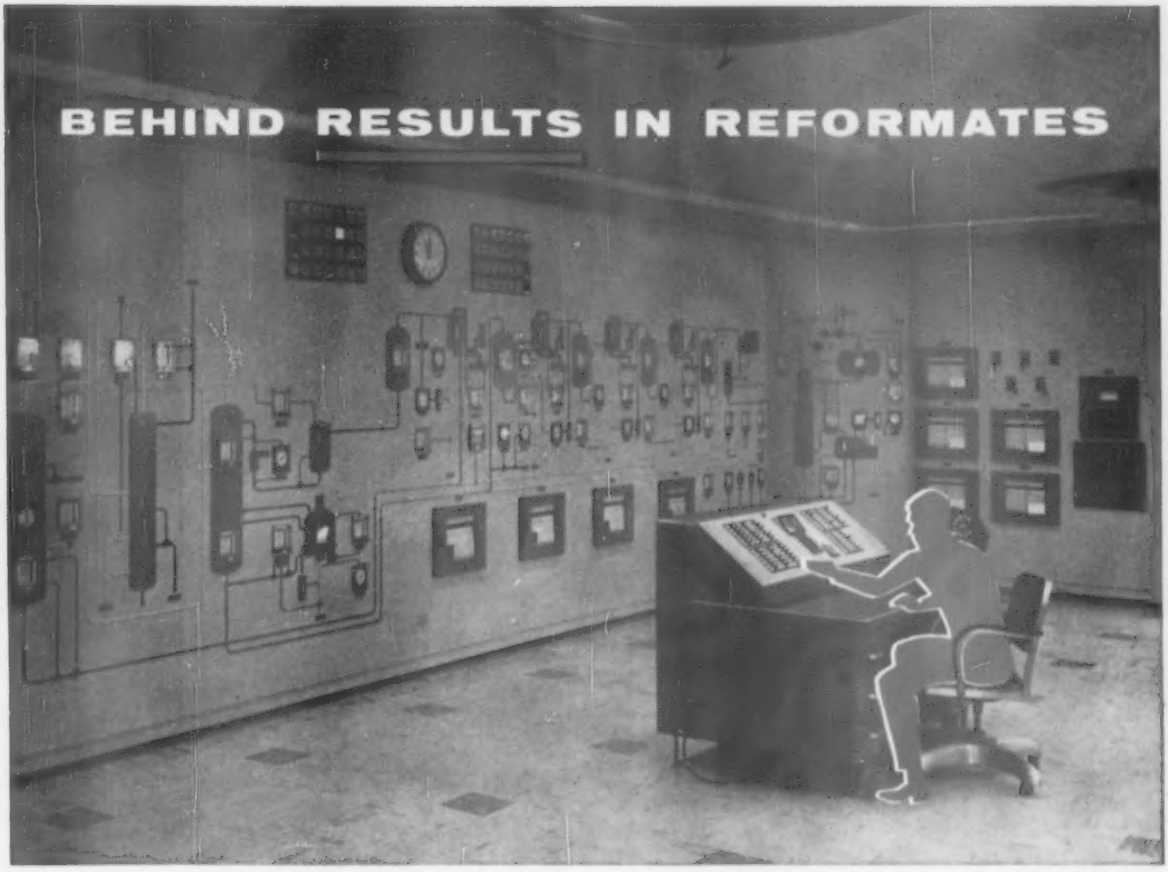
These versatile vehicles also supply mobile power. With power take-off, they operate many types of oil and gas industry equipment, from mobile drills to winches.

Rugged 'Jeep' vehicles spread their costs over many jobs... provide additional savings through long life, low maintenance costs and high resale value. Ask your Willys dealer for an on-the-job demonstration today.

The 'Jeep'®
family of 4-Wheel-Drive vehicles
WILLYS...makers of the world's most useful vehicles

*Model CJ-5 shown

WILLYS MOTORS, INC., TOLEDO 1, OHIO



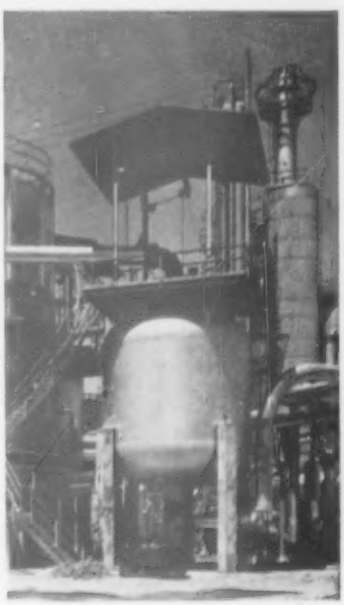
Another Kellogg Example of Engineering Teamwork

Above is the control room for Sinclair Refining Company's modernized refinery at Houston, showing instruments at the right for one of the largest and most efficient cat reformers ever built. Designed for 24,000 BPD of 95 octane clear (101 leaded) on a 3-reactor blocked-out system, this reformer is the result of engineering teamwork between Sinclair Refining Company and The M. W. Kellogg Company. It typifies M. W. Kellogg's ability to work harmoniously with oil refiners toward the optimum solution to a specific refining problem.

This cat reformer is the second to be erected by The M. W. Kellogg Company using Sinclair-Baker regenerative catalyst RD-150. Process and catalyst together provide a new and economical way for Sinclair to increase yields from present feedstocks and to get high octane reformates from low grade naphthas.

Kellogg-designed cat reformers, engineered from the laboratory and pilot plant data of both Kellogg and Sinclair, enable refiners to obtain reformates of 100 octane clear with naphthas from Kuwait crudes, and 102 with naphthas from Mid-Continent crudes. Quick start-up is assured. Cost of catalyst per barrel of reformate is lowered. A major Kellogg contribution is the desulphurization phase of the process, which sharply reduces equipment corrosion and catalyst contamination.

Nine other catalytic reforming units of this process design are now on M. W. Kellogg's drawing boards for major oil refiners. All will yield reformates of 95 octane clear or better.



One of three reactors for the catalytic reformer at Sinclair's Houston refinery.

REFINERY PROCESS DIVISION

The M. W. Kellogg Company

711 THIRD AVENUE, NEW YORK 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York
Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

the Mid-Continent Supply Company

MACHINERY MAN

His job is to *Serve you!*

A staff of experienced machinery men is at your service when you order oil field equipment from Mid-Continent Supply Company. Their job is to serve you, to aid you in selecting equipment best suited to your requirements.

In rigging up your new equipment, Mid-Continent's Machinery Department engineering service and field supervision help assure money-saving drilling operation.

For a single item or a complete drilling rig "package", it pays to call Mid-Continent.

MID-CONTINENT
Supply Company
MID-CONTINENT BLDG • FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Clear proof you can prevent plugging caused by iron in injection water!
CITRIC ACID ADDED
In this glass, only 10 ppm of Pfizer Citric Acid has been added to brine containing 2 ppm iron
NO CITRIC ACID
The brine in this glass also contains 2 ppm iron. But no citric has been added

● The cloudiness of the brine at right is caused by insoluble iron salts. Continuous injection of this water in secondary recovery causes plugging at the interface.

As you can see from the picture on the left above, Pfizer Citric Acid keeps the iron in your injection water from precipitating out...and thus piling up deposits at the interface.

Net result: Regular use of Pfizer Citric Acid will keep your injection rates high easily and economically. Also cuts down the frequency of expensive acidizing.

Pound for pound, citric acid sequesters iron better and at less cost than any other agent. High calcium and magnesium waters will not interfere with citric's iron-sequestering ability.

Nontoxic, safe to handle–Pfizer Citric Acid is excellent preventive medicine–whether for secondary recovery or pressure maintenance work. Pfizer supplies huge amounts of citric acid for a multitude of industrial uses throughout the world. This broad distribution pattern assures you of receiving all the citric you need without delay. (Just recently, Pfizer has opened a new warehouse in Dallas to serve the Southwest.)

For further information on preventing injection well plugging with Pfizer Citric Acid write to:

Manufacturing Chemists for Over 100 Years

Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Texas

available now in all field locations

SCHLUMBERGER

NO-PLUG SHAPED CHARGES

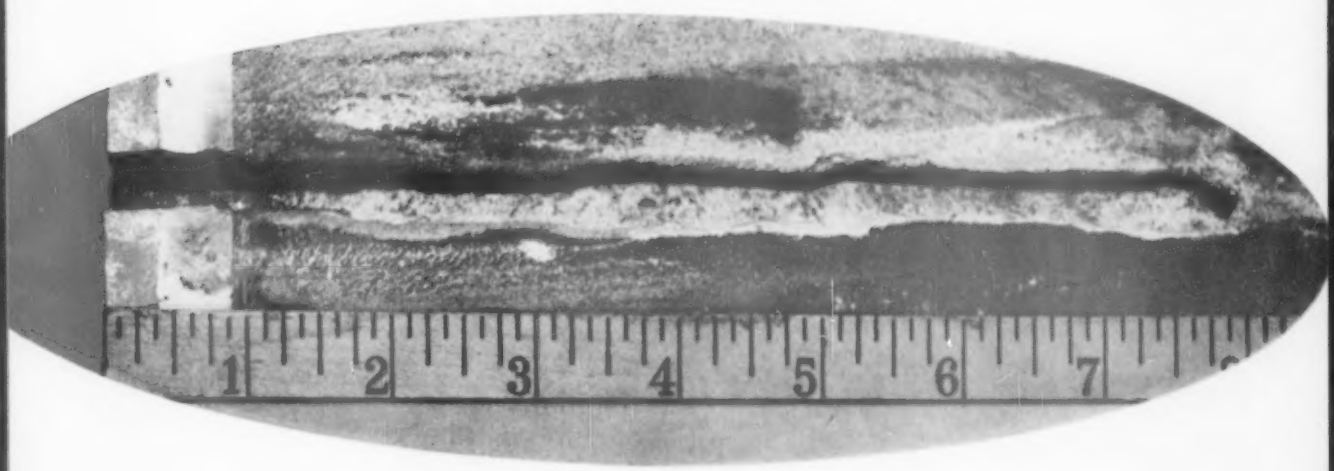
Schlumberger NO-PLUG Shaped Charges are Available Now . . . in all field locations for 4", 3½", and 2⅜" perforators.

For Shaped Charge Perforating that **Cannot be Plugged** — call Schlumberger.

Schlumberger...to be sure!

. . . a remarkable development in perforating

No-Plug 4" shaped charge fired in Berea sandstone target. Note excellent penetration and hole size.



THE NO-PLUG CHARGE MAKES A CLEAN HOLE . . .
THERE IS NO FLOW-OBSTRUCTING SLUG OR DEBRIS.

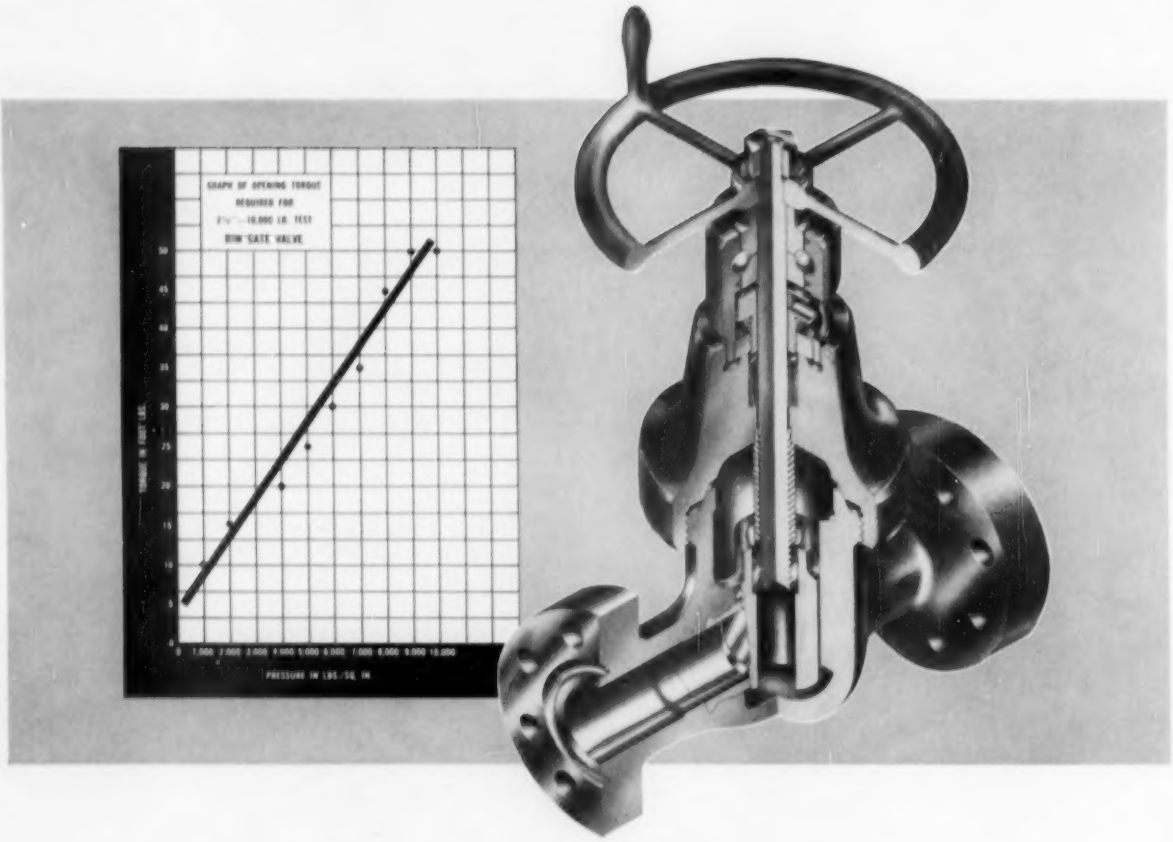
Tests simulating field conditions made under water—under pressure—or in air all show the same results:
There is **NO DEBRIS IN THE PERFORATION.**
This means that the full length of the perforation is effective every time in draining your formation.

PENETRATION AND HOLE SIZE ARE NOT SACRIFICED

Perforating characteristics of the new charge maintain the high standards set by the former Schlumberger charges. This is confirmed by the target above.

SCHLUMBERGER
WELL SURVEYING CORPORATION

FIRST IN THE FIELD—FOREMOST IN RESEARCH



BIW NON-LUBRICATED GATE VALVE

Opens and Closes Easily UNDER PRESSURE

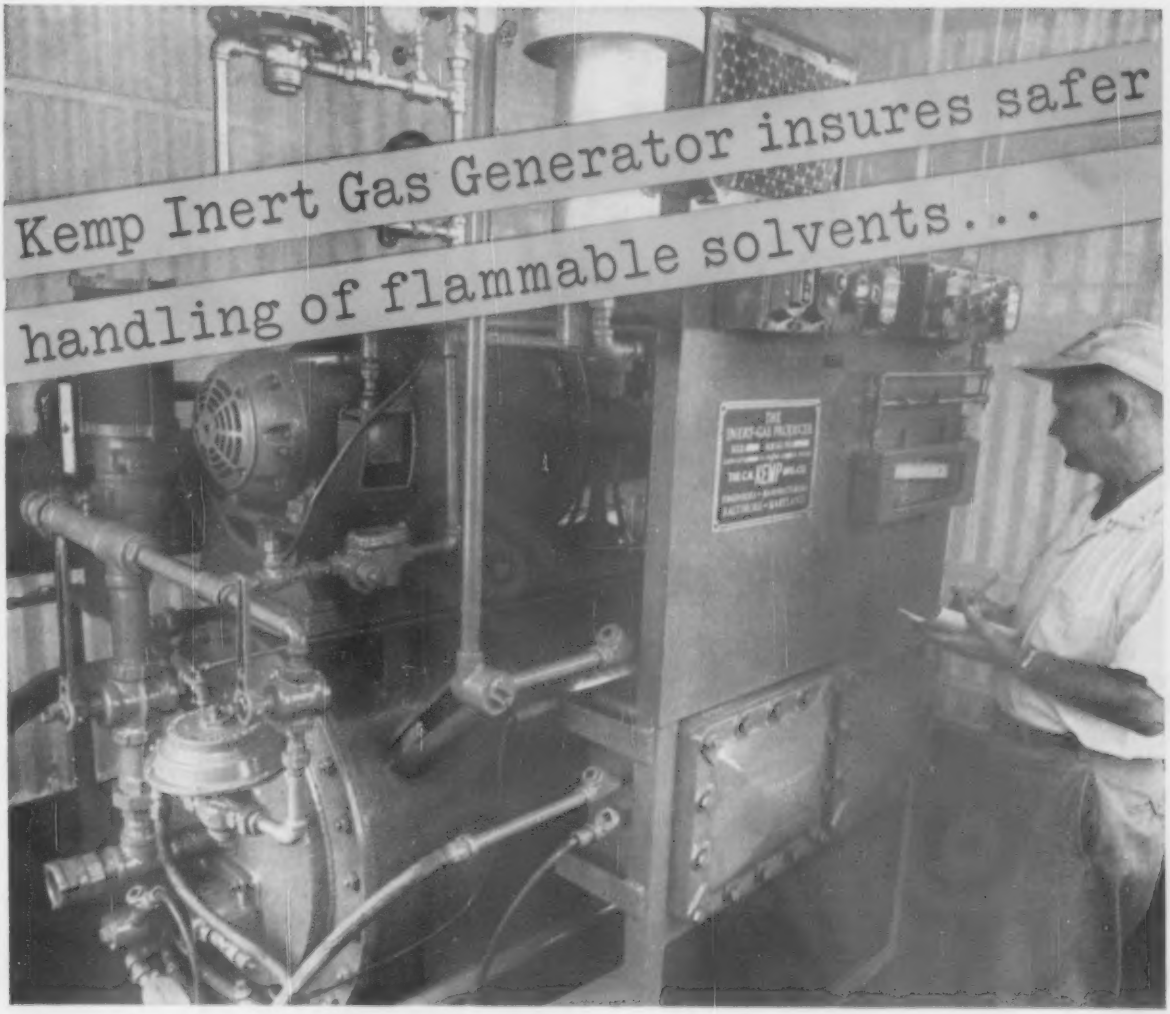
Look at this graph showing the low torque necessary to open or close under pressure. Here is a truly easy to operate valve. And because no lubricant is required, the BIW Non-Lubricated Gate Valve is always ready to open or to seal tightly. The metal-to-metal seal — proved in more than 35,000 BIW valves in the field — holds tight. Once in, you can forget it. No man-hours wasted on lubrication. Simplified design for years of service without trouble. Have your BIW man show you the complete BIW Christmas tree with the proved BIW Non-Lubricated Gate Valves. *Oil tool sales office: 1404 Dunlavy, Houston 19, Texas.*

ALCO

ALCO PRODUCTS, INC.

New York

Sales Offices in Principal Cities



Quaker State reports:

Kemp Generator maintains steady inert gas supply for blanketing—even under varying load conditions!

In this Quaker State Oil Refinery, in Farmer's Valley, Pa., a Kemp 3,000 cu. ft. per hr. Generator is used to provide inert gas atmosphere to blanket vessels containing flammable solvents. Mr. Joe O. Brown, Process Engineer, says that the Kemp Generator, in use since 1949, is a big improvement over a previous model replaced by this 3-MIHE.

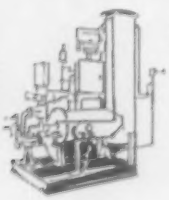
Kemp does all inert gas jobs better

Kemp Gas Generators are easier to operate, start quickly, give continuous output around the clock. Even under fluctuating loads uniform analysis is maintained. Pipelines and vessels can be purged easily, quickly, for cleaning and inspection or when processes are changed! Kemp Generators are also ideal for annealing, hardening, and sintering. Kemp has the ability to produce a chemically clean inert at a specific analysis *regardless* of demand!

Investigate NOW

Find out how Kemp Engineers can provide the most profitable answer to *your* inert gas problem! Write for Bulletin I-10 today.

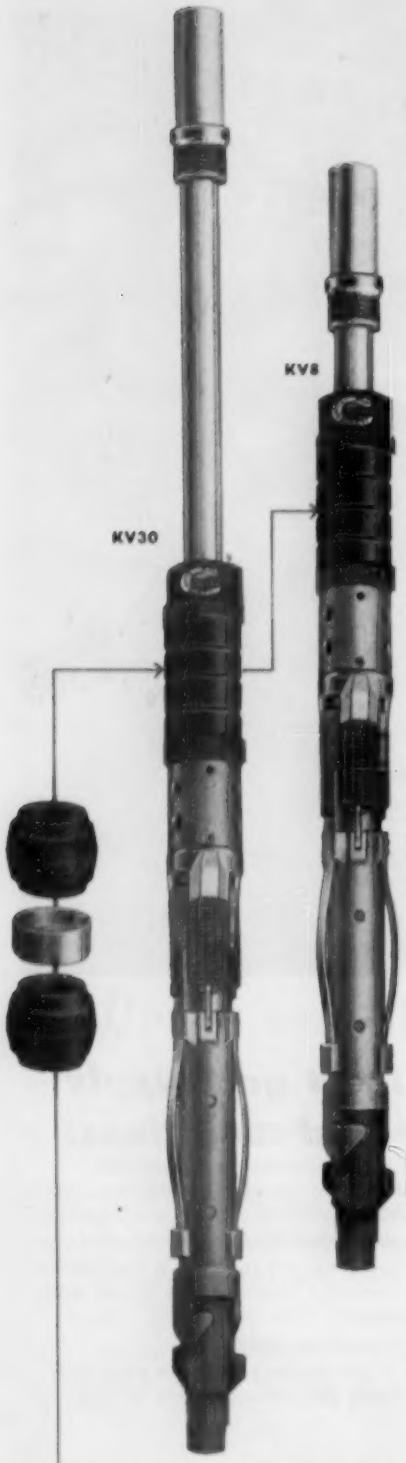
KEMP OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • DYNAMIC DRYERS
FIRE CHECKS • METAL MELTING UNITS
SINGEING EQUIPMENT

THE C. M. KEMP MFG. CO.
405 East Oliver Street, Baltimore 2, Maryland



Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost. One-piece sleeve rubber shown on packers furnished unless otherwise specified.

Durable and Dependable

GUIBERSON'S *KV* PACKERS

Here is the retrievable packer that operators everywhere count on for rugged durability and dependable performance. The KV Packer is designed for wells up to 12,000 feet deep. Construction is as simple as it is tough and husky — price is reasonable. In short, the KV Packer gives you more packer for the money — quick setting, easy pulling, ample bypass and positive seal.

- Made as the KV30 with 30″ valve stroke or the KV8 with 8″ valve stroke for standard below-packer circulation. Available in casing sizes, 4½″ through 9⅝″.
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Choice of two types of rubbers, both made of special oil and gas resistant compound. Will not vulcanize to casing — recovers original shape when released.
- Easy operating jay-hook type latch with heat treated friction springs.

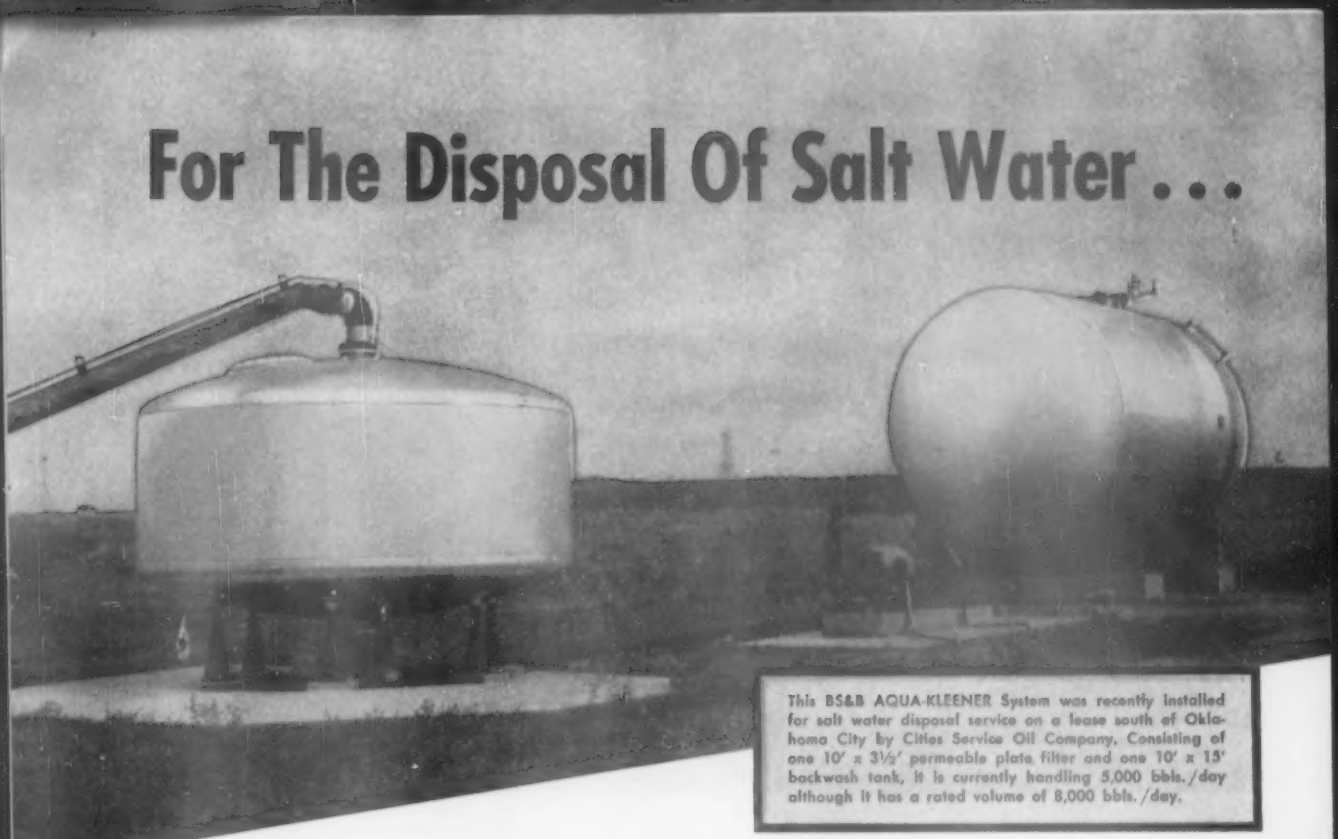
GUIBERSON

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere

For The Disposal Of Salt Water . . .



This BS&B AQUA-KLEENER System was recently installed for salt water disposal service on a lease south of Oklahoma City by Cities Service Oil Company. Consisting of one 10' x 3½' permeable plate filter and one 10' x 15' backwash tank, it is currently handling 5,000 bbls./day although it has a rated volume of 8,000 bbls./day.

Cities Service Chose BS&B AQUA-Kleener!*

Like Cities Service Oil Company, more and more lease operators with salt water disposal problems involving sub-surface injection, surface disposal or offshore disposal are installing today's *outstanding* water conditioning and filtering system—BS&B AQUA-KLEENER!

AQUA-KLEENER is a closed type system which prevents air from contacting the water—thereby minimizing corrosion, excluding air-borne bacteria and preventing the oxidation of such substances as soluble iron. When the improved filtering equipment shown here is used in conjunction with the BS&B AQUA-KLEENER oil skimmer it removes oil traces and solid particles from lease-produced water, well water or surface waters and greatly extends the service life of water injection wells.

The use of permeable underdrain plates and Anthrafilt No. 1 as the filtering medium in the AQUA-KLEENER Filter gives longer filter runs, superior operating results and reduced maintenance cost because of more thorough cleaning during backwash, and the elimination of filter bed disruption.

*AQUA-KLEENER is a trade name of Black, Sivalls & Bryson, Inc.

If you have a water disposal problem, why not talk it over with your BS&B Man? He'll gladly recommend the right combination of AQUA-KLEENER equipment to take care of it. Or, you may write to . . .

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.
Oil & Gas Equipment Div., Dept. 1-A10A
P. O. Box 1714 Oklahoma City, Oklahoma

DMS

Introducing...

DME

SURFACTANTS

for

Flocculated Drilling Muds

"A new flocculated, neutral-pH drilling mud promises to eliminate most of the mud problems found in deep drilling. New types of surfactants provide lubricity and excellent chemical and thermal stability. It has allowed drilling of thousands of feet of previously undrilled shale and has stood up to temperatures of 400°F."... *Oil & Gas Journal, Sept. 10, 1956.*

DMS, the primary flocculant-defoamant, and **DME**, the emulsifier, are new chemicals specifically developed for use in the make-up of Surfactant Muds. Ample stocks, technical data and engineering service at the rig are now ready. Consider this recent advance in petroleum technology in planning drilling and completion operations, wherever mud-making shale or high temperatures are expected.

Antara Chemicals supplies these products to the petroleum industry through competent mud service companies. Write or call now for complete information.

available from
BAROID
MAGCOBAR
MILWHITE

From Research to Reality

ANTARA
gaf

ANTARA CHEMICALS
A SALES DIVISION OF
GENERAL ANILINE & FILM CORPORATION
435 HUDSON STREET • NEW YORK 14, NEW YORK

Go First-Class on All Your Needle Valves, too

For high pressures . . . for low pressures . . . in all types of Christmas Trees, O-C-T Needle Valves have been tested and proved to be unquestionably the safest, strongest ever built.

O-C-T Needle Valves feature one-piece alloy steel bodies, welded bonnets for maximum safety and a multi-compound, non-crushable V-type packing especially developed to cope with those high pressures and high temperatures.

Stem packings are of plastic asbestos and aluminum foil compound suitable for 15,000 and 30,000 psi hydrostatic tests.

Each valve is subjected to a compressed air test under water before approval by inspectors.

The best in pressure gauge needle valves is by O-C-T! Available through more than 700 supply store outlets.

O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Export Representatives: Sterling Areas—Le Grand Sutcliff & Gell Ltd. Manchester, Kent England. South America—East West Offices, C. A. Del Lago Motel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas

The Mid-Continent petroleum industry grows bigger every year . . . and Lone Star's close-at-hand inventories of API casing, tubing and line pipe are helping busy oil men get the job done . . . faster and more economically.

Joe Roughneck, whether he's on a rig or running a major company, knows his straight-shootin' friends at Lone Star . . . knows Lone Star's superior API pipe . . . and likes the convenience of Lone Star's quick delivery and prompt service.

Neighbor, wherever you are . . . specify Lone Star and we both get a good deal!

Lone Star STEEL COMPANY

LSS

EXECUTIVE-SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

They Say—

One California Bright Spot

Dear Sir:

The Journal has been merciful in not emphasizing the unfortunate battle in California over Proposition No. 4—the Oil Conservation-Control bill.*

But your readers might like to know that the Kern County Oil Information Committee, which includes both "No" and "Yes" companies, did work together on one project in the middle of the bitter campaign. The county fair, attended by a record-breaking 180,000, had a prize winning exhibit on the R. M. Pyles Boys Camp, under an archway that read "Oil Industry Youth Program."

The exhibit told the story of the high Sierra camp built and maintained by the oil industry where since 1949 over 2,000 youngsters from oil communities have spent 2 weeks in the summer in the back country, 6 miles from any road. Prime qualification for the boys is that they would not otherwise have a chance to go camping. The inspiration of the mountains and trees—the camp is in the home of **Sequoia gigantea**, the world's oldest living thing—has "raised the sights" of many boys that needed a boost.

That's good for the boys and good for the oil industry. We're glad in California right now that we have such a wonderful example of service to others to pull us together and to boast about in these otherwise divisive times. You will take comfort in the fact that when the decision is reached at the polls there will still be plenty of "glue" to hold together the California oil industry.

Morton N. D'Evelyn
M J M & M Oil Co.
Bakersfield, Calif.

*Written before opening your October 1 issue.

Indiana Gusher Holding Up

Dear Sir:

We read with interest the article on page 58 of the October 1, 1956, The Oil and Gas Journal concerning the gusher drilled in an old area around Tulsa. We, too, have drilled in an old area recently with a great deal of success.

We now have three flowing wells 3 miles southwest of Princeton, Ind., in an area that has been active on and off for the past 40 years. We are especially happy about them because they are holding up so well. Our No. 1 Key Unit was 10 weeks old yesterday and still flowing (½-in. choke) at the rate

of 102 bbl. per day. We have two other wells each flowing about 100 bbl. This morning's gauge for the past 24 hours was 306 bbl. These wells are in the Benoist (Bethel) sandstone at a depth of 2,150 ft.

Inasmuch as the rest of the world seldom connects Illinois and Indiana with oil, I am writing this to say that Texas, California, and Oklahoma are not the only states which have gushers.

Stuart G. Noah
Noah Petroleum Co.
Albion, Ill.

Editor's note: Heartiest congratulations to Stuart Noah and Noah Petroleum Co. on their excellent Benoist sand wells southwest of Princeton, Ind. It is an outstanding accomplishment to locate and complete such prolific production in a 40-year-old area.

What Are Reasonable Imports?

"If we consider the consumption of oil in this country in relation to our reserves, both proven and potential, there is every reason to augment our oil supply by reasonable imports. Otherwise, at some distant day in the future the United States will be short of oil . . . Our country's foreign policy is based on the principle that the development of international trade and the reduction of barriers to such trade between countries is one of the surest ways towards peace and prosperity in the world.

M. J. RATHBONE

"These seem to me to be strong reasons why we should favor reasonable imports of oil into this country. . . . What are reasonable imports? . . . I think there are at least two conditions in connection with consideration of this question. First, the level of imports should not be such as to reduce the strength, vigor, and incentive of the domestic oil industry to carry forward an exploration and development program which would maintain the proven reserves . . .

"The second consideration relates to our ability to deal with the emergency of having part or all of our imports cut off due to political, military, economic, or natural crises. We should be able to face such situations with assurance of drawing for a time more heavily on our own proven reserves.

"If imports occupy no more than a fair share of our growing market, it seems to me that the best interests of our domestic producers, our importing companies, and our national security will be served, but I feel very strongly

an ACCO product

Helicoid Gages

No Gears! No Teeth!

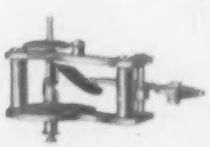
The gage of enduring accuracy

HELICOID Gages—without gears or teeth—last longer in rugged gage service because they eliminate the major sources of gage trouble. There can be no wearing and fouling of teeth or excessive play between teeth because there are no gears, no teeth in HELICOID Gages.

No expense has been spared in extensive research, engineering and testing equipment to produce this outstanding pressure instrument—a gage of the utmost precision and enduring accuracy.

HELICOID Gages are available for practically every type of installation and service—in many sizes and many styles—for pressure, vacuum or compound service. Furnished in a full range of pressures; all with the HELICOID stainless steel movement.

Write today for the HELICOID Gage Catalog



1 Stainless Steel HELICOID Roller (no gear teeth).
2 Stainless Steel Hair Spring.
3 Long Life Cam (no gear teeth).
4 Corrosion-resistant Link and Screws.

ACCO

Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-A Connecticut Avenue • Bridgeport 2, Connecticut

for Better Value

Two Great Oil Well Service Companies

BJ SERVICE and

BJ Service and Chemical Process (Breckenridge, Texas) have combined to form a great new oil well service force. This natural partnership of two strong 25-year-old service companies offers you—the customer—both immediate and long-range benefits. These include:

Greater field strength... including fifty-six field stations, more than 900 experienced service personnel and 800 units of mobile equipment.

New oil well services... the interchange of service techniques and formulae will open new services both to BJ Service and Chemical Process customers.

The newest and most powerful equipment... newly-developed high pressure pumping units and newly-perfected special-purpose tools are ready to be introduced by this powerful new service partnership.

Great new advances in research... two major research and testing laboratories at Breckenridge, Texas and Long Beach, California will coordinate their development projects on service techniques, tools and equipment for your job improvement.

Greater *service*... more efficient *processes*... these are the benefits to you from this important new partnership!

John B. Merritt, executive vice president of BJ Service, and R. G. Miller, executive vice president of Chemical Process, shake hands and join forces in a powerful new oil well service organization.

BJ SERVICE

Since 1928, this company has been a pioneer in oil well cementing services, and is recognized as "the company that put quality competition into the business." In addition, it is also recognized as a leader in the field of perforating. *Service* is its middle name.

CHEMICAL PROCESS

Since 1932, this company has been a pioneer in well stimulation service. C.P. developed Permeter service, blocking agents and other services with which the company augments fundamental acidizing and fracturing procedure, plus a personnel which applies more than 2,000 man-years of experience to these operations, add up to complete, progressive, top quality well stimulation service.

Combine!

BJ Service

THE CHEMICAL PROCESS CO.
SERVICING OIL & GAS WELLS

Chemical Process

GREATER SERVICE STRENGTH THROUGH THIS 56-STATION NETWORK!

The stations and services of these two strong companies complement and supplement one another. Chemical Process specializes in fracturing, acidizing and permeability meter surveys in Texas, Oklahoma, Louisiana, Kansas and New Mexico. BJ Service provides cementing, perforating, acidizing and radioactivity logging services in California and Rocky Mountain fields and cementing services in the Permian Basin.

- *BJ Service stations*
- *Chemical Process stations*

NOW...members of the Borg-Warner Team!

Under this new partnership, BJ Service and Chemical Process will operate as part of Borg-Warner's great industrial group... which includes leading manufacturing and service companies in such diversified fields as petroleum, automotive, aircraft, electronics, steel, agriculture, plastics and nuclear power. They also participate in the Borg-Warner Research Center...with access to some of the world's finest scientists and engineers.

Chemical Process
General Offices and Laboratory
Breckenridge, Texas
Stations Throughout the Mid-Continent Area

CHEMICAL PROCESS
BJ Service

BJ SERVICE, INC.
General Offices and Laboratory
Long Beach, California
Stations Throughout California, Rocky Mountain and Permian Basin Areas

DO AS THE ROMANS DID

From Roman armor to the flak suit, complete protection has been accepted as the only worthwhile kind. Since 1939 Tube-Kote has perfected techniques to insure *complete* protection against corrosion. This experience is your assurance of complete protection.

TUBE-KOTE

SERVICE MARK REG. U. S. PAT. OFF.

CUSTOM

PLASTIC COATING FOR SPECIALTY ITEMS

Custom Coating – the newest service of Tube-Kote, manufacturers of world-famed TK-2 – offers plastic lining protection for specialty items subject to corrosion or contamination. Backed by 17 years of experience in applying plastic

linings to metal surfaces, this new Tube-Kote service features the use of TK-2 plastic, TK-31 epoxy coating, and TK-88 Teflon.

A specially engineered process is designed for custom coating each item to provide it with the best protection.

TK-2 Plastic – This plastic is most practical for use on items needing protection against corrosion damage and certain abrasive actions. Proved in field use on more than 16,000,000 feet of oil field pipe, TK-2 combines inertness with toughness, hardness, and adhesion to make it the outstanding finish for custom coating. TK-2 is available in TK-2 Standard for prevention of corrosion; and TK-2 Special for prevention of paraffin deposition; and TK-2 Custom Kote for extra duty protection in tanks, valves, fans, fittings, pumps, Christmas trees, mandrels, etc.

TK-31 Modified Epoxy. Newest baked-on product in the expanded line of engineer-approved Tube-Kote plastics. TK-31 combines flexibility, toughness, special abrasive resistance characteristics, and exceptional bonding ability . . . making it the answer to many unusual problems in coating or lining applications.

TK-88 Teflon – This plastic is a high-temperature, anti-sticking material. It provides excellent protection against both sticking and scaling.

Tube-Kote
INCORPORATED
2727 HOLMES ROAD
P. O. BOX 20037
HOUSTON, TEXAS

that this situation should be attained by careful study of the over-all picture, a broadminded objective appraisal of responsibility, and individual, voluntary action on the part of importing companies — not by government control . . ."

M. J. Rathbone, president, Standard Oil Co. (N. J.), in a speech at the thirty-seventh annual meeting of the Texas Mid-Continent Oil and Gas Association, Houston.

Born 30 Years Too Soon

Dear Sir:

I don't have the date of the article but if you will look back some time in the late '20's you will find an article of mine on the Las Animas Arch published in The Oil and Gas Journal. It has taken nearly 28 to 30 years to see my prediction borne out.

I leased considerable land on the Las Animas Arch and had to drop it during the depression, but the time wasn't ripe. I find now that all the surface structures that I had leased and worked on are now covered by large companies. I was just too far ahead!

It took nearly as long to see Arizona come into production since I did my first work there is 1917, close to 40 years ago. I still think that the southern part of the basin has a chance for production. It certainly hasn't been adequately tested.

Dorsey Hager
Consulting Geologist
Salt Lake City.

A Greater Pipeline Bargain

Dear Sir:

In your issue of September 17, 1956, the Annual Pipeline Number, is an article entitled, "Pipelines—Greatest Transport Bargain."

The table showing comparison of rates over products pipelines vs. railroad charges erroneously gives pipeline rates from Linden, N. J., to Pittsburgh as 32 cents, and Syracuse as 35 cents. You will no doubt be interested to know that the Buckeye Pipe Line Co. tariffs . . . name rates from Linden to these points as 31½ cents and 21¾ cents respectively. An even greater "bargain."

J. J. Brown
Traffic Manager
Buckeye Pipe Line Co.
New York.

Why Federal Road Plans?

"During the debate on the proposed federal $33.8-billion highway program the country was told that an immediate start on the 41,000-mile road network was absolutely necessary if the country was not to go to pot.

"A lot of people sniffed quite loudly

UNIVERSITY LANDS

Oil and Gas Leases

TO BE OFFERED BY

THE BOARD FOR LEASE
OF
THE UNIVERSITY OF TEXAS
LANDS

AT

THIRTY-EIGHTH PUBLIC AUCTION

TUESDAY, NOVEMBER 27, 1956

COMMENCING AT 10:00 A.M. AT THE
COMMODORE PERRY HOTEL
AUSTIN, TEXAS

List of leases and additional information obtainable from:

Board for Lease of University Lands
P. O. Box 7986—University Station
Austin 12, Texas

or

University Lands—Geology
P. O. Box 1663
Midland, Texas

Seeco-Mul saves drilling costs.

Compared to ordinary emulsifiers, Seeco-Mul will lower your maintenance costs, and, because of the superior properties in Seeco-Mul you will:

Get faster penetration, less balling on bottom, less torque on the drill stem, better control of heaving and sloughing shales,

longer life from collars, bits and tool joints, pump liners, and other equipment. Many leading mud engineers recommend Seeco-Mul to improve hole conditions, to

get a better completion, and make a better well. Seeco-Mul is packaged in sturdy, 50-pound sacks that are easy to handle around the rig, and any qualified mud engineer can use it without special equipment or special instructions.

Seeco-Mul Makes a Good Mud Better.

Ask your local mud dealer, or write to Crossett Chemical Company, Crossett, Arkansas.

CROSSETT

Seeco-Mul

DRILLING MUD EMULSIFIER

at some of these claims, projections, and calculations, but Congress went ahead and raised taxes on gasoline and tires to raise the funds the Government will need to meet its 90 per cent share of the total cost.

"Now, though, the engineers who will have to build the roads see some difficulties. The big problem, as they see it, is the lack of factual data for a sound 41,000-mile cobweb of roads the supporters of the federal program insist is necessary.

"We take this to mean that there is not enough information gathered together to build a sound system of roads. And what that means is that the idea is there, the money is there, but nobody yet has come up with reasons why."

Editorial in the Wall Street Journal.

Suez: One Certain Result

"Whatever ultimately happens over Suez, it's certain that some form of long-range economic action will be taken by the NATO countries to reduce the dependence of Western Europe on supplies of oil from the Middle East. That means an even more intense interest in the oil fields of North and South America."

Editorial in the Toronto Financial Post.

CALENDAR OF EVENTS

OCTOBER

23-26 National Association of Corrosion Engineers, south central region, San Antonio.

24-26 Tracerlab Symposium on Applications of Radioactivity, Hotel Statler, Boston.

25-26 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, nineteenth annual meeting, Sheraton Park Hotel, Washington.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-31 Energy Resources Conference, sponsored by the Denver Chamber of Commerce, Denver.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological

LEE C. MOORE

TRAILER MOUNTED MASTS

The top section of Lee C. Moore trailer mounted masts is retractable for greater mobility. Mast legs are in true alignment during drilling operations to assure maximum strength and rigidity.

LEGS IN TRUE ALIGNMENT NO OVERLAP . . .

SINGLE TRAILER MOUNTED MASTS
86 ft 94 ft. 97 ft. 97 ft. Heavy duty
100 ft. 126 ft. Export Model

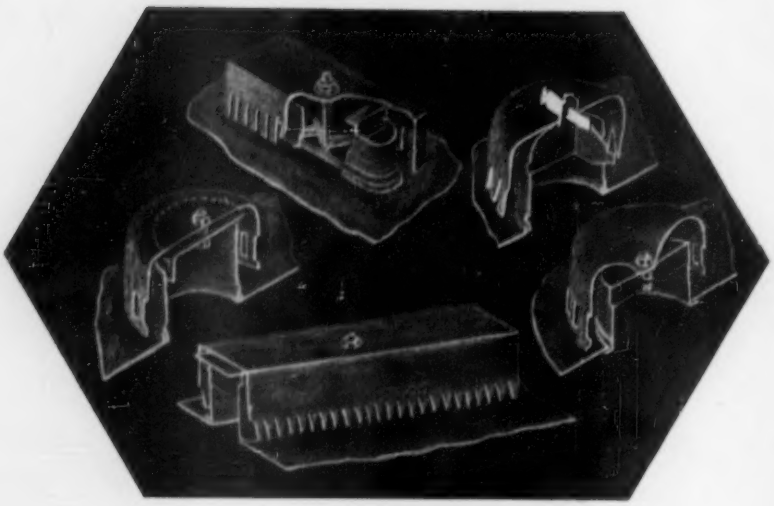
DUAL TRAILER MOUNTED MAST
97 ft. 100 ft. 126 ft. 126 ft. Export Model

LEE C. Moore CORPORATION

TULSA : SHREVEPORT : GREAT BEND : CASPER : NEW ORLEANS
CENTRALIA : DALLAS : HOUSTON : MIDLAND : PITTSBURGH

EXPORT OFFICE:—ROOM 624, INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, NEW YORK

FOREIGN LICENSED MFR. OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND



Glitsch Bubble Cap and Riser Assemblies have been the standard of the petroleum and the chemical industries for years. As a result, we have dies for more than 300 different caps and risers for every process requirement. Virtually every conceivable type and design can be furnished, in either round or rectangular assemblies, with a full range of sizes and materials.

Glitsch Caps and Risers have a number of operating features not available in any other equipment. They are easy to install and remove, which reduces downtime for cleaning and allows the unit to be placed back on stream with a minimum shut-down time.

Your nearest Glitsch office will be glad to give you additional details and illustrated technical literature on Glitsch Bubble Caps, "Truss-Type" Trays, and other Glitsch products and services for the petroleum refining and chemical process industries. There is no obligation, and you will be pleased with the prompt and competent recommendations our representatives will make for your job.

Glitsch

Societies, sixth annual convention, Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8 West Central Texas Oil and Gas Association, annual technical and membership meeting, Hotel Wooten, Abilene, Tex.

8-9 American Association of Oilwell Drilling Contractors, eleventh annual drilling safety clinic, Statler-Hilton Hotel, Dallas.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

13-14 University of California, National Association of Corrosion Engineers, short course on underground corrosion, Lafayette Hotel, Long Beach, Calif.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-27 Kansas Independent Oil and Gas Association, nineteenth annual meeting, Broadview Hotel, Wichita.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

30 Natural Gasoline Association of America, Panhandle - Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

3-4 New Mexico Oil and Gas Association, annual meeting, Alvarado Hotel, Albuquerque.

6-8 Interstate Oil Compact Commission, annual meeting, Fontainebleau Hotel, Miami Beach, Fla.

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

11-12 Water Quality Control for Subsurface Injection, conference sponsored by the University of Oklahoma, Norman, Okla.

1957

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

21-55 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

FEBRUARY

17-18 Engineers, Joint Council, Statler Hotel, New York.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

COMPLETE RANGE OF SIZES AND MODELS IN BOTH MEDIUM AND HIGH PRESSURE TYPES

MORE COMPACT THAN EVER

P-952-A—Steam Turbine and Electric Motor drive gives flexibility in this compact Model P-ES2H size No. 25 unit.

NATIONAL AIROIL

FUEL OIL PUMPING AND HEATING UNITS

NATIONAL AIROIL Fuel Oil Pumping and Heating Units are specially designed to prepare, for combustion, all grades of fuel oil including No. 6 or Bunker "C" Oil and residuums. They will draw fuel oil from above ground or underground tanks, preheat it to proper constant temperature and deliver it to Oil Burners at an even pressure, best suited for the burners. Our Fuel Oil Pumping and Heating Units are the result of years of experience. They come completely equipped ready for steam, exhaust, condensate, oil suction, oil return and electrical connections. All valves, regulators, etc., are readily accessible. The piping arrangement is easily understood. These compact, space-saving units are available in a range of sizes and models in both Medium and High Pressure types. For complete details, write for our Bulletin 40 — very interesting and informative.

OIL BURNER and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
SLUDGE BURNERS, Steam Atomizing
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
DUAL STAGE, Combining Steam and Mechanical Atomization
LOW PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

NATIONAL AIROIL BURNER CO., INC.

1236 E. Sedgley Avenue, Philadelphia 34, Pa.
Southwestern Division:
2512 South Boulevard, Houston 6, Texas

how to

CUT CORROSION LOSSES

a report by Koppers Company, Inc.

C. U. Pittman
Supervisor Technical Services

Good surface preparation is basic to the life and effectiveness of protective coatings. Without it, the coating cannot bond properly and may fail to prevent future corrosion.

The surface preparation method selected depends on the type of surface, the degree of corrosion, contaminants present, the desired life of the coating and the physical accessibility of the surfaces to be coated.

* * *

To remove all traces of grease or oil, vapor degreasing or solvent cleaning is necessary *before* mechanical surface preparation. Acid cleaning or pickling to remove rust and mill scale is fast and usually low in cost. After treatment, the acid should be neutralized immediately.

Hand cleaning is recommended only on small jobs, or where areas are not easily accessible. The main problem in using chisels and pointed scrapers is to avoid high ridges which cause thin spots or holidays in the coating. Power brushing and scraping are two of the more common methods of preparing surfaces. For removing rust, they are both quite effective and, usually, reasonable in cost. We have found, though, that power brushing frequently polishes surfaces too much.

Flame cleaning is a good way to remove old coatings and to heat surfaces prior to applying a thermoplastic coating. Flame cleaners are also very good for drying damp surfaces. By creating thermal shock, flamers are an effective—though slow—way to remove mill scale. Surfaces should always be wire-brushed after flame cleaning.

Blast cleaning with sand or grit has proved to be the best way to remove incrustation, rust and mill scale, and is more economical than is generally realized. Blasting is fast on even the most irregular objects. Good practice leaves the surface free of high peaks, but with shallow valleys that make good "anchors" for the coating. Care should be exercised that the air used in blasting is free of oil. Coatings should be applied immediately after blasting or the surface should be primed quickly with WP-1, two compartment type wash primer. WP-1 should also be applied if the cleaned surface cannot be completely dried.

* * *

Concrete and masonry surfaces are prepared best by hand cleaning, power brushing or chemical cleaning. Brushed surfaces should be blown clean with oil-free air, and chemical cleaners should always be neutralized, or removed by flushing, immediately. Patching and repair work should be prepared in the same manner as the original surface.

* * *

The extra care and investment in thorough surface preparation always pay dividends in effective, long-lasting corrosion protection.

Your corrosion problems are our business. If you have any questions on which you'd like assistance, write: Koppers Company, Inc., 1301 Koppers Building, Dept. 104K, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto, Ontario and Edmonton, Alberta.

KOPPERS

BITUMASTIC
REG. U. S. PAT. OFF.
COATINGS AND ENAMELS

DESIGNED TO TAKE IT . . . ANYWHERE!

SLASH FIELD OFFICE COSTS WITH A MOBILE **SPARTAN "DIRECTOR"**

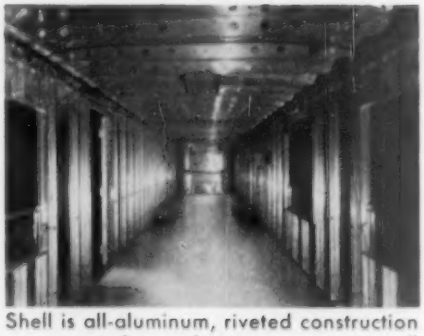
You don't have to build and abandon a field office or entire camp anymore—mobile Spartan Directors are meeting a wide variety of field housing needs. Whether you need a single unit . . . for office . . . expediting work in remote areas —or whether you are setting up an entire oil field camp—Spartan Directors are the most economical. They're built for rugged use . . . they're comfortable and convenient . . . and they're mobile. Spartan builds units for practically any field use—like mess halls, radio shacks, power generating plants, employee leisure rooms, and housing units with up to three bedrooms.

For further information, write, call or wire:

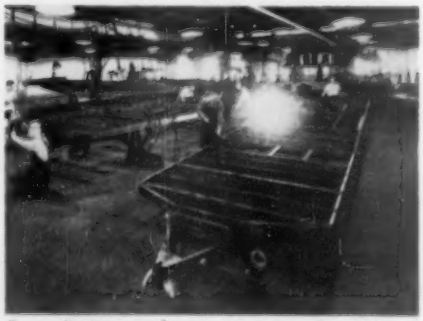
INDUSTRIAL SALES DIVISION

SPARTAN
AIRCRAFT COMPANY

1900 NORTH SHERIDAN ROAD / TULSA, OKLAHOMA



Shell is all-aluminum, riveted construction . . . no wooden studs to warp, rot or swell . . . no nails to rust or pull out.



Foundation or frame is rugged, unitized steel construction . . . one-piece continuous roll-form steel longerons, and electric-welded cross members and gussets.

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY ... Mid-Continent Manager
PREN G. HOLLINGSWORTH ... Representative
D. B. MILLER ... Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
E. S. KLAPPENBACH ... Eastern Manager
JAMES W. BROWNLEE ... Representative
HARRY B. BULLEN ... Representative

PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets, RI 6-0118
JOHN W. MEANY, JR. ... District Manager

CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY ... District Manager
KAREL WEGKAMP ... District Manager

DETROIT
204 Washington Square Building,
Royal Oak, Mich., LIncoln 7-9455
JOHN D. YODER ... District Manager

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES ... Manager

HOUSTON
Sterling Building, CA 4-7726
JOHN M. SPEARS ... Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building, STerling 3074

LOS ANGELES
650 South Grand Avenue, VAndike 0722
GEORGE O. RUPPERT ... District Manager

ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER ... European Representative

•

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00; 3 years, $8.00. Single copies; regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1956 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING . . .

Master's Touch

THE Big Yellow Book has finally made the grade. We've arrived. We're enshrined in literature and ensconced in academic circles.

We've had a thesis written about us.

For a good many months the staff had been dimly aware that a sweet girl graduate had been flitting around our shop, asking lots of questions, and poring over old bound volumes in the library. We understood that she was writing a thesis for a master's degree in journalism from University of Missouri.

Then one day last month in walked Miss Sara S. Bangert, M.A., and proudly exhibited bound copies of "The History of The Oil and Gas Journal—A Study in Trade Journalism."

It's quite a tome—146 pages of it. Good reading, too. It tells things about us we never knew before—at least no one person ever had all the dope.

Sara found our favorite oil publication has an interesting personality and an intriguing genealogy.

Starting with a general survey of the field, she announced that "business papers are not as glamorous or colorful as the modern newspaper or magazine" (tsk, tsk, Sara; and we try so hard).

But before she had got far she concluded that "The Oil and Gas Journal is generally considered to be an outstanding example of the best type of trade journalism," and then later cautiously conceded that it "seems to exemplify the highest type of trade publication" (thank you, Miss Bangert.)

Reviewing the Big Yellow Book's struggling start at Spindletop, the young researcher found that by 1910 it had "succeeded in establishing itself as a leading oil publication . . . because of its own concept of reader service . . . a certain pride in its work, in its industry, and in its own integrity."

During the 1920's the Journal's main editorial theme concerned "urging the industry to solve its own problems, championing free enterprise, and discouraging federal control . . . [it] pioneered in conservation efforts . . . overproduction was so prevalent that the Journal urged that competitors slow down in production . . . saw quite early the necessity of a unified public-relations program . . . [but] the Journal's good advice was generally disregarded" (things haven't changed much, Sara).

Turning to our editorial policy of the last couple of years, she noted that the Journal has frequently said that the price of oil is too low, imports are too high, and federal regulation of natural gas is bad. Then she volunteered "these are three issues in which the industry seems to be fairly well united in opinion" (Oh, Sara, how can you be so naive?).

Being a student of the techniques of journalism, Sara paid particular attention to the 50-year panorama of changes in format, typography, presentation, and writing style. She was quite critical of our amateurish experiments in the early '40's, and at one point observed "the habit of putting about every other paragraph in editorial matter in bold face made things even worse."

But she approved our more recent efforts: "The Journal is progressive in . . . readable writing and layout . . . shows that the secret of success in trade-paper publication is to make the magazine interesting and useful to the industry."

But here's the payoff. Sara not only showed her good judgment in selecting a subject for a thesis, but her timing in presenting it was perfect.

On the very day that she walked in, one of our young news men announced that he had accepted another job. How to fill the post? Here was the heaven-sent answer—the girl who had just written a book about us.

Pert, perky Sara is now well established at a desk in the news department, and she looks like a permanent fixture. At present she's working mostly on our "Personals" pages and doing other odd chores around the shop which make her useful as well as ornamental.

But give her time, and she may be showing cards and spades to all the rest of us. Why not? Even before she started to work she knew more about us than any of us do, even the old timers.

—*Henry D. Ralph.*

Here's that Outstanding Combination

for BETTER primary cementing...

... BAKER CASING CENTRALIZERS to provide clearance for a uniform body of cement around the casing—and BAKER WALL SCRATCHERS to scratch away the mud cake and expose the formation for better bonding of the cement.

EFFECTIVE CENTERING

BAKER CASING CENTRALIZERS have a balanced combination of proper spring *length*, and proper *bowed height* to provide EFFECTIVE CENTERING FORCE over the entire area to be cemented. And each spring is pre-tested and pre-set to ensure having this Vital Centering Force *at the cementing point* regardless of depth or hole deviations.

CONTROLLED SCRATCHING

BAKER WALL SCRATCHERS perform a "Controlled" scratching job because the wires remain close against the casing while running in the hole and *do not damage the vital filter cake* on the way down the hole. Only when the actual "wall scratching operation" is commenced, do the overlapping wires (mounted in a strong DOUBLE shell) go to work scratching away the mud sheath and exposing the formation for *far better bonding* of the cement.

AVAILABLE IN EXACT TYPE AND SIZE REQUIRED

Baker Casing Centralizers are available in either the hinged (Model "H" HINGE-LOK, Product No. 9113, illustrated) or slip-on (Model "G", Product No. 910-G) models, each with a complete range of spring-bowed heights for each casing OD—one exactly right for most casing clearance programs. Baker Model "C" Wall Scratchers are also available in either the hinged (Model "C" HINGE-LOK, Product No. 900-C, illustrated) or slip-on (Model "C" Solid Ring, Product No. 901-C) models with your choice of 2½-inch (C-25) or 4½-inch (C-45) scratcher wires. Ask your Baker Representative about this *outstanding combination* for better primary cementing.

BAKER OIL TOOLS, INC. • HOUSTON • LOS ANGELES • NEW YORK

BAKER

WALL SCRATCHERS
CASING CENTRALIZERS

Here's what the Suez crisis showed

THE Suez crisis, it now appears, may be resolved without serious disruption of the world's oil trade. But the threat that this vital artery of oil commerce might be closed pointed up some problems which the industry ought not to put back in the pigeon hole.

There may be other sudden international crises upsetting the supply-demand balance of petroleum and requiring quick shifts in the pattern of operations in the United States. The lessons of the Suez scare should not be forgotten.

In the first place, this country got the assuring news that we have ample reserve capacity to produce more than the 500,000 bbl. per day additional crude oil that was said to be needed if the canal closed.

RESERVE CAPACITY is a comfortable thing for the public and a necessity to national defense. It is wise policy to have some at all times. But the problem of how to finance it, though often posed, has never been solved satisfactorily.

Short of a complicated system of government controls and subsidies, the best solution is a crude price high enough to permit producers to carry shut-in reserves, plus a proration system to keep the reserve crude in the ground until it's needed.

In the second place, we learned that crude capacity is of little value by itself. Between crude in the ground and products in the hands of consumers there must be a complicated system of pipelines, refineries, tankers, and terminals. This must be an integrated system, a going concern. It can't be expanded much just by turning valves.

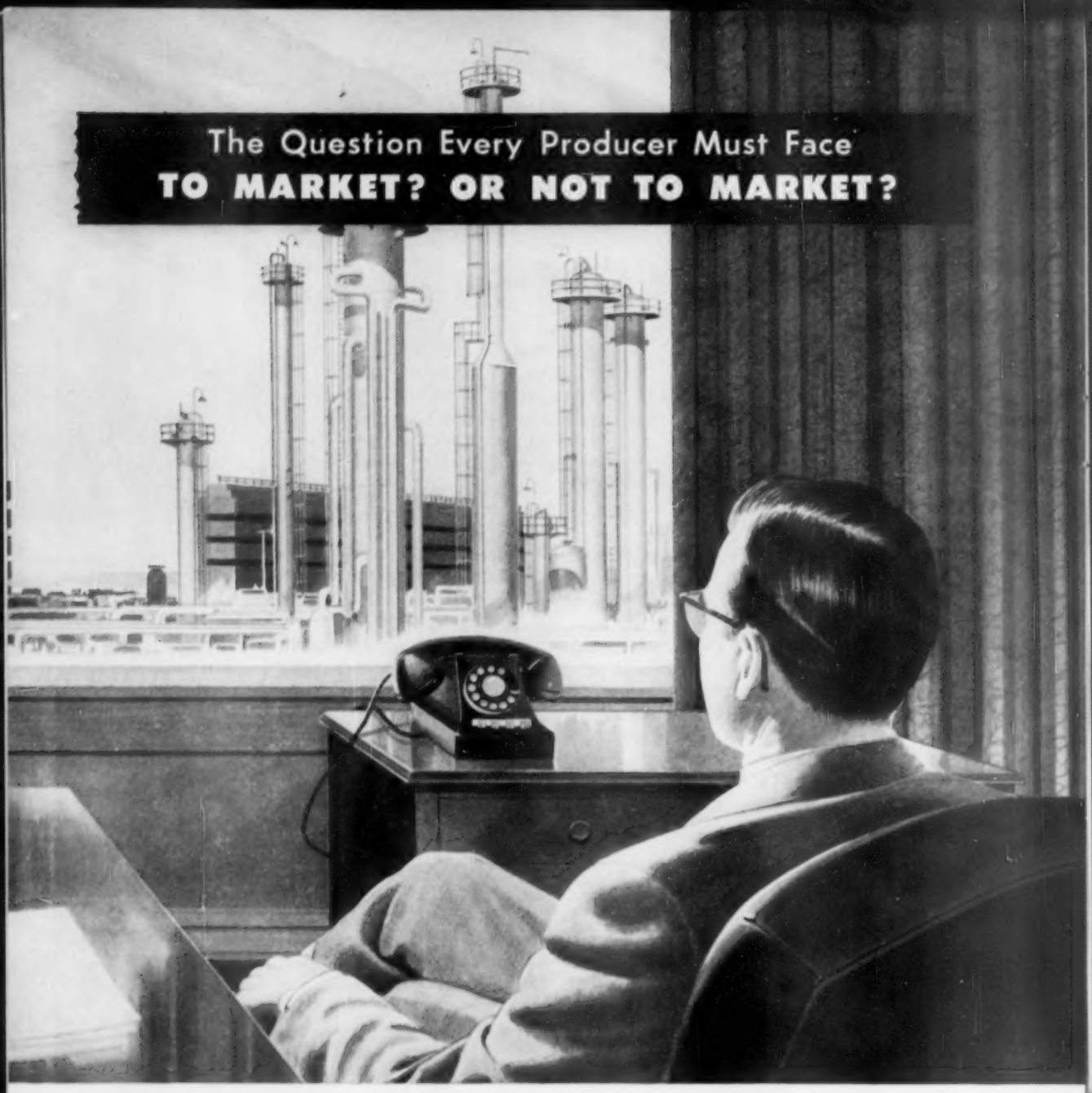
Here again is the problem of carrying unused but costly facilities. If national policy requires that we have reserve slack in refining and transportation capacity, the policy should be better defined and better handled to keep the excess earmarked as reserve.

In the third place, we need a clearer policy on how much this country should depend on foreign sources of oil. The Suez threat forcibly raised again many of the old arguments on this question.

THE IMPORTS PROBLEM is complicated by a great many other considerations. But from the standpoint of national defense probably the most important question is whether we should always have enough oil capacity to take care of ourselves and perhaps some for our friends.

If so, then imports should be tailored to that fine point where they are big enough to keep us from using our own crude too fast, but not big enough to discourage expansion of our domestic industry.

Also, our planners should not forget that to translate crude in the ground to gasoline in the car requires a balanced industry. Reserve capacity in just one segment of the business is of little value in an emergency.



ANCHOR

CAN DO IT FOR YOU MORE ECONOMICALLY AND AT FAR LESS TROUBLE TO YOU . . .

Your specialty is producing or refining. Your problems are large enough to require your entire attention. Anchor is a specialist in marketing. Anchor men devote all their time and interests to the problems peculiar to their phase of the oil industry. It just stands to reason that you'll be saving yourself a lot of trouble and money if you'll let Anchor do your marketing for you.

Anchor has the physical facilities to do the job: A huge fleet of tank cars which are routed all over the United States; three vast underground storage installations; a nationwide sales organization to keep the products rolling.

Or, maybe, sometimes you need petroleum products? Anchor can readily supply them. So, whether you want to sell, or buy, call Anchor and get the details — Tulsa, CHerry 2-7261.

ANCHOR PETROLEUM CO. • TULSA

SALES OFFICES: Des Moines, Shreveport, Toledo, Houston, Long Beach, Oklahoma City, Midland, Texas, San Francisco, Seattle, Salt Lake City, East Paterson, N. J., Hattiesburg, Miss., Macon, Georgia, Minneapolis, Minn., Calgary, Canada.

Current and significant in . . .

The Industry This Week

Production

• **New gas-liquid solvent drive** promises oil recovery approaching 100 per cent. Three versions of laboratory-proved method were unveiled for A.I.M.E. Petroleum Branch. All are refinements of gas repressuring or a combination of gas repressuring and water flooding. P. 66.

Size of Israel's Heletz field may dwarf original estimates. Reserves proved by development drilling have jumped six times in past few months, and field is still not clearly defined. P. 85.

Processing

• **Gas chromatography is emerging** as a new process tool for refining, petrochemical, and natural-gas plants. Once limited to the laboratory, the gas-stream analyzer now has bright future because it's fast, cheap, gives better analysis, and is adapted to process control. P. 62.

A 100,000-bbl. refinery will be built by Esso at the Welsh fishing village of Milford Haven which has a port capable of handling supertankers. P. 88.

Process for irradiating polyethylene to improve its end uses has been acquired by W. R. Grace from Sequoia Process Corp. Process will tie in with Grace's $18-million, high-density polyethylene plant now building at Baton Rouge. P. 65.

Pipelining

• **A 600-mile crude line** from Four Corners area to Los Angeles is under consideration by Shell and Standard of California. Plans call for 14-in. line with initial capacity of 50,000-bbl. daily. P. 74.

Importance of pipelines are growing. They're moving bigger share of crude than at any time except for war year of 1944. Also they're gaining products service while relative position of barges and tankers declines. P. 78.

Industry

• **Voluntary controls over imports** apparently are to be retained for at least another year. That's recommendation of cabinet fuels committee. It asked that Middle East Imports be kept to 299,600 bbl. daily, only a 1 per cent cut from first-half 1956 averages. P. 68.

A billion-dollar tanker fleet to take up slack of any Suez Canal closure is being talked by government officials. Envisioned is construction of 50 supertankers within next few years. P. 72.

Drilling

• **Limited-scale drilling has resumed** in disputed tidelands off Louisiana following temporary state-government settlement. Anderson-Prichard was first to get permit. It put to work idle equipment that had cost it $400,000 during the shutdown. P. 70.

Rotary drilling rates have been boosted more than 100 per cent in some cases in South Louisiana by increasing hydraulic horsepower on pumps from 500 to 1,500 with corresponding increase in bit weights. P. 65.

Exploration

• **Lake Maracaibo operations** of Atlantic Refining and Sun Oil will be expanded under a farmout the two firms obtained from Venezuelan American. The deal may be a tip-off to others brewing in Venezuela. P. 84.

Continental Oil has acquired 394,000-acre exploration concession in Flores area of Peten in northern Guatemala. Acreage will be combined with concessions granted Ohio Oil and Amerada for unit operation. P. 88.

Gas chromatography comes of age with big splash at Pasadena gathering as . . .

New Fast, Cheap Analyzer

LOS ANGELES.—Gas chromatography is cracking its cocoon.

Once the process was restricted to laboratory use as a tool allowing researchers to analyze the components of a gas stream. Now it is ready to move into refining and petrochemical plants as a process-control tool.

And it may even go into the field for determining composition of wet natural gas in field processing plants.

These developments were demonstrated graphically for delegates attending the California Natural Gasoline Association meeting at nearby Pasadena last week. Instrument manufacturers put on quite a show of equipment designed to monitor process streams.

Manufacturing representatives reported only a few of the continuous stream analyzers probably will find their way into plant operations in the next few months. But they claim the many advantages of the chromatographic equipment make its ultimate popularity assured.

Advantages . . . Chromatographs eventually are expected to replace the charcoal-adsorption test now used to analyze gas streams because they are:

. . . **Faster,** allowing frequent, automatic analyses of streams instead of the once daily laboratory tests.

. . . **More specific,** thus giving a better analysis.

. . . **Adapted for process control** use.

. . . **Cheaper** in the long run.

All the advantages add up to a method of giving unit operators a frequent accurate analysis of the stream so variations of its components can be detected quickly and adjusted.

An old technique . . . Chromatographic techniques have been known for 50 years.

But only in recent years has any serious effort been made to develop the method into an analytical tool for light hydrocarbon fractions. Looking back, researchers can't understand why this fast, precise, relatively cheap instrument was overlooked. They claim no other single analytical technique has the power of gas chromatography.

Of the some 12 manufacturers commercially producing gas chromatographs, eight had their latest type models on display at the Pasadena meeting. Most were primarily designed for laboratory work, but several were applicable to plant process monitoring.

What's ahead . . . Ultimate goal of gas chromatography is an instrument which can:

. . . **Monitor continuously** the composition of refinery and gasoline plant process streams.

. . . **Regulate automatically** temperatures or other operating variables to maintain the composition of any key component at the desired level.

Great strides have been made in this direction in the past year. One manufacturer currently has orders for three units to be used in process-control at petrochemical plants. They will analyze butadiene and ethylene streams.

First reported use of a continuous

WHAT IS Chromatography?

IT consists basically of passing a mixture of gases through a chromatographic column and forming a two-phase system. The column is either of the adsorption or partition type. And separation of gases is based on the affinity the sample components have for the selected adsorbents.

The adsorbents . . . Various adsorbents are available—either activated charcoal, alumina, or silica gel. In the adsorption columns the sample gas is displaced from the adsorbent by a gas of greater adsorption affinity. In elution-partition columns a carrier gas is used to wash the sample through an inert solid coated with a nonvolatile liquid.

How it works . . . Identifying and measuring various mixtures works like this:

The different components of the gas travel through a partition column at different rates of speed.

Concentration of each component generally is measured by a thermal conductivity cell. A pair of cells is used in a Wheatstone bridge circuit. The carrier gas alone passes through one cell. The eluted sample gas plus some of the carrier gas passes through the second. The unbalanced signal from the bridge plots the concentration of each component on a recorder.

The plots on the recorder are shown as a series of peaks. Identification of eluted peaks may be made directly from reference materials.

Quantitative measurement is achieved by measuring the area under the peaks.

. . . equipment makers display imposing array of machines for labs and plants.

Of Gas Streams Makes Bow

plant-stream analyzer was at the Linden, N.J., refinery of Esso Standard Oil Co. (*The Oil and Gas Journal, July 2, page 66*). A gas absorption chromatograph built by Esso Research & Engineering Co. was installed at Linden to analyze continuously the propane content of the propylene charge to a polymerization plant. A second analyzer is being used in a gas absorption plant. Complete analysis of the streams is recorded at half-hour intervals in the control room.

Remote control . . . One instrument shown at Pasadena attracted much attention because it could be adapted for remote control.

The equipment was a new process chromatograph developed by Consolidated Electrodynamics Corp. Using the elution method, the instrument was designed so that a control unit for the analyzer could be placed up to 500 ft. from it.

The analyzer, with vaporproof housing for use in hazardous locations, consists of the packed column, a solenoid-operated sampling valve, four thermal conductivity cells, and all necessary heaters and thermostats.

The gas or vapor to be analyzed flows continuously through the sampling valve and the solenoid injects a precise amount into the carrier stream.

The instrument sells for about $3,500. The "home-made" analyzers used at the Esso refinery each cost about $12,000. Explanation for this difference: The devices are simple in construction but the assembly, calibration, and standardization require considerable time.

Wet-gas testing . . . Another straw in the wind came from a portable unit introduced by Podbielniak, Inc. It indicated chromatographic methods may become the standard for determining gasoline and L.P.G. content of natural gas.

The unit weighs 15 lb. and is about the size of a two-suiter. It also is self-contained, including a supply of carbon dioxide which is used as the carrier gas. Gas from the column enters a nitrometer, containing a strong caustic solution which reacts to eliminate the carrier gas. Thus only components of the sample emerge consecutively to be measured in a calibrated glass burette. Composition of the gas is computed from these readings and then plotted in graphic form with an accuracy of approximately 1 per cent.

S. T. Preston of Podbielniak said the new instrument is capable of accurately analyzing mixtures of light hydrocarbons from methane to butane, including a determination of the pentanes-plus content, inert gases, olefins, and diolefins.

Preston added the accuracy obtainable makes it appear the method "should be seriously considered as a potential royalty test method which avoids the weaknesses of present charcoal test procedures." He said "its ability to determine accurately propane content of field gases is sufficient to

justify its investigation by the technical committees of the two natural-gasoline associations."

The portable units will be loaned to both the C.N.G.A. and the Natural Gasoline Association of America so that their field testing committees can investigate their potentialities as a standard test method, he said.

Other possibilities . . . When gas chromatographs first became commercially available in the spring of 1955, some advocates claimed they would supplant existing analytical techniques.

It now appears gas chromatographs will find their places beside the other analytical methods, supplanting only a few. In particular they are expected to be most effective when used with low and high-temperature distillation, infrared, ultraviolet, and mass spectroscopic equipment.

As for its use as a process-control method, Preston predicted:

"The speed with which results are obtained and the high degree of reliability of the method have stimulated several companies to supplement the automatic vapor phase chromatographic analyzer with an electronic computer and read-out system, capable of controlling the equipment producing the stream being analyzed.

"In the future we will probably see the use of automatic vapor phase chromatographic analyzers to continuously monitor various plant streams. For example, absorber residue gases, L.P.G. products, recycle streams, plant intake gas, and others in a natural-gasoline plant all can be analyzed cyclically with a single apparatus.

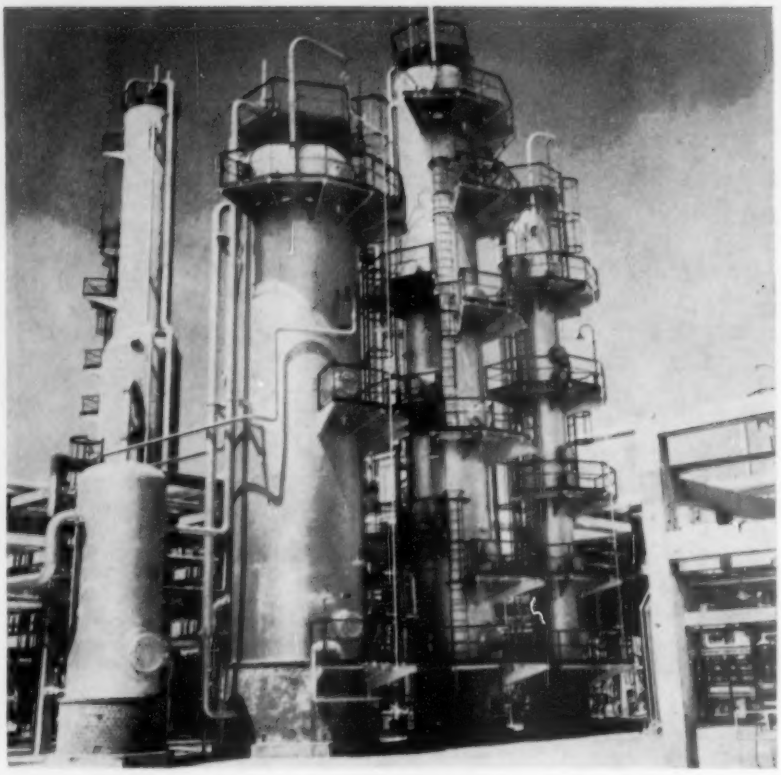
"The operator of the future will find it far easier to adjust oil rate and other operating variables when faced with a continuous record of the composition of the various plant streams."

Pipeline Acquires Affiliate

WASHINGTON.—Texas Eastern Transmission Corp., Shreveport, has won Federal Power Commission approval to absorb its subsidiary, Texas Eastern Production Corp.

Texas Eastern Production was permitted to abandon natural-gas sales to its parent and Arkansas Louisiana Gas Co. Texas Eastern will take over sales to Arkansas Louisiana without interruption. It owns 93 per cent of the common stock of the production firm.

Temporary authority for the merger was granted last December 1. Texas Eastern said it would result in utilization of its own production, thereby increasing flexibility of its pipeline operation. Bargaining power with independent producers would be stronger and overhead would be reduced under the combined operation.



Gas Plant Expands Tidewater Refinery

ASSOCIATED, Calif.—Tidewater Oil Co. has put into operation a new 88,000,000 cu. ft. gas processing plant at its Avon Flying A refinery 4 miles east of Martinez, Calif.

The gas plant, the second of three major units under construction at the facility, and the fifth gas plant at Avon, will extract propane, butane, and gasoline from gas from a fluid coking unit also under construction and an existing thermal cracking unit.

The final unit in the expansion program at Avon, the world's largest fluid coking plant with a 42,000-bbl. daily capacity, is still under construction.

T.G.T. Maps Huge New Expansion Program

WASHINGTON. — A $167-million expansion project was offered for Federal Power Commission approval last week by Tennessee Gas Transmission Co.

The company laid out a plan to build 1,085 miles of pipeline and 117,240 hp. in compression units. The new facilities will increase the daily delivery capacity of the T.G.T. system by 456 million cubic feet *(The Oil and Gas Journal, September 24, page 84).*

With other increases previously proposed and still awaiting FPC action, it would give Tennessee an average daily delivery capacity of 2,471,701,000 cu. ft. and a peak of 2,886,076,000 cu. ft. New line will be added from Louisiana to New York.

Tennessee proposed a 557-mile stretch of 30-in. starting below New Orleans. It would link the east end of the company's new "Muskrat" line on the Gulf Coast with its main system at Portland, Tenn. Near the western end of the Muskrat line, T.G.T. plans 120 miles of 26-in., 20-in., and 12-in. pipe to connect with fields off Cameron and Vermilion parishes which are now shut-in. About 68 miles of this line, running southward from Kinder, La., would be under the Gulf of Mexico.

These and other facilities, including some 300 miles of 24-30-in. loops, will give the T.G.T. access to an additional 6.6 trillion cubic feet of natural gas. Initial price will be 21.4 cents per M.c.f., with escalation to 29.4 cents by 1974 and perhaps 35.4 cents eventually. Delivery of the offshore gas, purchased from the C.A.T.C. Group, is to start not later than November 1, 1957.

Whirlwind Drilling

Rotary rates speeded by 100 per cent in Louisiana; more hydraulic horsepower is key, but other factors important

LOS ANGELES.—Operators in South Louisiana have boosted rotary-drilling rates more than 100 per cent in some cases by increasing hydraulic horsepower of pumps from 500 to 1,500 with corresponding increases in bit weights.

Drilling rates in some of these fields could be increased an additional 12 per cent by applications of 2,000 hydraulic horsepower.

That's the report Ralph A. Watson and R. E. Sullins, engineers of Humble Oil & Refining Co., made to the annual fall meeting of the petroleum branch of A.I.M.E. here last week.

Other factors . . . However, Watson and Sullins said before the 2,000 hydraulic horsepower pumps can be of any advantage, these other factors must be included in the drilling program:

. . . 5,000-psi. operating surface pressures.

. . . Five-in. diameter drill pipe.

. . . More efficient drilling bits.

Subsurface structural conditions also exist where mud problems would eliminate advantage of increased hydraulic horepower, the Humble engineers said. In formations where heavier muds are required but a reduction in horsepower is needed to maintain best operations, the 2,000 hydraulic horsepower pumps would be just excess baggage. The 2,000-hp. operations lose their effectiveness where power must be cut back due to circulation losses.

Watson and Sullins stressed that key to successful use of higher hydraulic horsepower pumps is being able to maintain high surface pressures.

Requirements . . . The engineers reported Humble's experiences with the 1,500-hp. pumps showed drillers will have to go to 5-in. drill pipe to gain full advantage of 2,000-hp. pumps.

Without larger drill pipe, friction losses in the smaller 4-in. pipe would cancel out benefits of the 2,000-hp., the authors said.

Manufacturers also will have to redesign pumps to handle 5,000-psi. working surface pressures required for maximum efficient use of greater horsepower. This work in South Louisiana boosted cost of pumps 31 per cent in one case where hydraulic horsepower was jumped from 500 to 1,500.

Watson and Sullins pointed to another area of needed improvements: Bits and the entire system of hole cutting. They remarked this phase of drilling has not kept pace so far with development of increased hydraulic horsepower.

Diaphragm slush pump . . . A second Humble project also was revealed. It involved successful development of a diaphragm for isolating expendable moving parts of a slush pump from abrasive drilling fluids.

Martin E. True and W. M. O'Reilly reported that Humble's pump in addition to the protective diaphragm includes a system which automatically maintains a constant volume of fluid in the intermediary system.

In a 9-month comparison run with a conventional pump, Humble's diaphragm-equipped job operated at a considerable economic advantage. Costs of the expendable parts in the diaphragm pump amounted to only 58 per cent of the cost for similar parts in the conventional pump, True and O'Reilly reported.

The diaphragm pump required only one liner change to six for the conventional pump. In the same period, the diaphragm pump needed only three new pistons to the other's nine. No new piston rods were required on the diaphragm pump while the conventional pump had six badly cut rods.

True and O'Reilly concluded from Humble's experiments and field operations with their diaphragm pump that it gives every evidence of being a commercial success.

Air and gas drilling . . . In a series of experiments in wells in West Texas, North Texas and New Mexico, Humble reported favorable results in almost all cases where compressed air was substituted for drilling fluids.

In reporting Humble's findings, George E. Cannon and Ralph A. Watson said that in one Texas Panhandle well a single bit was used to drill a 603-ft. interval at an average rate of 69.3 ft. per rotating hour. An offsetting well drilled with conventional mud made only 4.3 ft. per rotating hour in the same zone.

Danger of fire and explosion around gas-drilled wells has been greatly reduced by development of better rotating strippers on the kelly. Gas-filled cuttings are piped away from the rig and burned. Fans on the derrick floor maintain proper air circulation. Fire extinguishers and fog-nozzle water hoses also cut down possible explosion-fire dangers.

Lab experiments indicated little surface danger would result from downhole explosions in gas-air drilling conditions. But there is a danger from hot gases which would shoot out the flow line at rates up to 6,900 ft. per second.

Drilling crews are taught to stay away from flow lines, Cannon and Watson said. Such explosions down the hole likely wouldn't damage subsurface equipment too badly. The chief danger to such equipment would be a resulting fire which would melt everything.

In summarizing their work, the authors stated that air and gas drilling results in greatly increased drilling rates plus longer bit life. The major restrictions to its use are the problems of formation waters and a higher hole deviation.

Process Acquired

W. R. Grace will irradiate polyethylene at new plant

PHILADELPHIA. — W. R. Grace & Co. has acquired a process for irradiating polyethylene to improve and expand its end uses.

An exclusive licensing agreement with Sequoia Process Corp., Redwood City, Calif., was disclosed by J. Peter Grace, president of W. R. Grace. Sequoia has been using gamma radiation from a cobalt-60 source to toughen polyethylene wire coating.

The process, says Grace, will tie in with its new $18-million high-density polyethylene plant now building at Baton Rouge, La. The new plant will take ethylene from Esso Standard Oil Co.'s nearby refinery and will use Phillips Petroleum Co.'s process. The cross-linkage that results when polyethylene is exposed to gamma radiation raises the melting point, tensile strength, and heat resistance, and reduces cold flow and stress cracking of the versatile plastic.

Although commercial irradiation is now done only on wire coating, Grace visualizes its further application to sterilizable containers, filaments, pipe and pipe linings, coatings, fibres, and insulation for electrical components. Unirradiated polyethylene melts and breaks down within 30 seconds when dipped into molten solder, for example, while irradiated product remains unaffected.

The Hyrad process will be made available to Grace customers for incorporation into their manufacturing lines. Grace will also provide technical service on the process

Three firms unveil new idea which shows . . .

How to Sweep a Pool Clean—Almost

Kenneth B. Barnes
Editor

LOS ANGELES.—A new gas-liquid solvent drive which promises oil recovery approaching 100 per cent was unveiled at the A.I.M.E. Petroleum Branch meeting last week.

The laboratory-proved method, if successfully applied in the field, points to a breakthrough in the constant struggle to produce a greater portion of the oil in a reservoir. Most of it remains in the ground under present methods.

Results using three versions of the new process were disclosed in papers presented by research scientists from Atlantic Refining Co., Stanolind Oil & Gas Co., and Carter Oil Co.

Atlantic calls it the "miscible plug" process. Stanolind's is "solution" flooding. The Carter development is the "gas-driven liquid propane method."

All are a refinement of gas repressuring or a combination of gas repressuring and water flooding. They follow the same principles:

. . . **First a volatile liquid** solvent such as propane, then dry natural gas, are pumped down an injection well.

. . . **The propane front,** driven like a piston by the natural gas, displaces oil because it is miscible with the oil at its front contact.

. . . **The gas sweep** behind acts as a final cleanup, since the propane also is soluble in the gas, achieving virtually 100 per cent recovery.

Various types of well-known chemical compounds, such as industrial alcohols or other oil-miscible agents, could be used. But liquefied gases—particularly propane—have been found to be by far the most adaptable and economic.

Carter findings . . . Carter went beyond laboratory research and ran an actual field trial.

Its field test involved:

. . . **Repressuring** the reservoir to the vapor pressure of liquid propane.

. . . **Injecting the liquid** propane.

. . . **Injecting dry** natural gas to drive the propane and oil to the producing wells.

Considerable preliminary work also had to be done. There was new drilling, workovers, and a pressure survey before the test was run.

The field trial saw oil production rates average about nine times the final primary rates. The field average gas-oil ratio is still below the pre-test value.

Recovery to date is 112,000 bbl. of stock-tank oil. About one-third of the 143,000 bbl. of propane injected has been produced. Results are encouraging, and Carter is considering more and larger field projects.

The test was conducted in the Seminole City pool, Seminole County, Oklahoma. It was detailed by Loren Jenks, John Campbell, and George Binder, Jr., all of Tulsa.

A carefully calculated quantity of liquid propane was injected into the reservoir, which was at a pressure no lower than the vapor pressure of propane. As injection proceeded, propane flowed out in all directions from each input well, building up an oil bank ahead of it.

When all the propane was in the reservoir, gas was injected to move the propane and the oil to the producing wells. The propane was moved through the reservoir both as a liquid being driven by the gas and as a vapor being carried in the gas from a region of vaporization to a region of condensation. The moving propane drove the oil ahead of it.

Atlantic findings . . . H. A. Koch, Jr., and R. L. Slobod described the Atlantic process this way:

The propane displaces oil completely at one front because it is miscible with the oil. Gas displaces the propane completely at a second or trailing front because it is miscible with the propane. A small band of propane remains wedged between the gas and oil phases.

The feasibility of this method was demonstrated using a small slug of propane to displace reservoir oil from a long laboratory-simulated reservoir.

In one experiment the reservoir fluid was displaced from a 123-ft. unconsolidated-sand packed tube by a very small slug of propane (equivalent to only 1.5 per cent of the total pore space). The propane in turn was displaced by a lean gas phase at 2,900 psi. The ultimate recovery of stock-tank oil by this slug process was 95 per cent of oil-in-place.

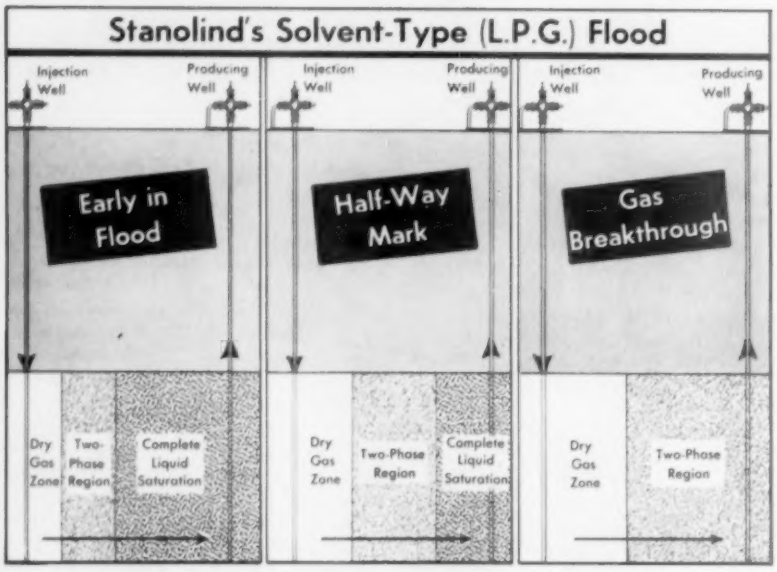
This represents a large increase over the 66 per cent recovery obtained from using lean gas alone at 2,900 psig. Such an increase (over the very favorable gas drive) is about 11 bbl. of stock-tank oil per barrel of propane injected.

These results are fairly typical of the successful propane slug displacements and forcefully illustrate the great potential which is at stake.

Stanolind findings . . . Whether propane will be completely miscible or only partly miscible in the crude oil depends on the reservoir pressure and temperature.

Stanolind authors H. N. Hall and T. M. Geffen gave this distinction particular attention in their investigations.

For the complete form, they reported that as the solvent moves through the reservoir, the front of the solvent



Stanolind's Recovery Results

Drive agent (gas) and reservoir liquid—	Pressure (psig.)	Per cent residual saturation at gas breakthrough: Lab test	Per cent residual saturation at gas breakthrough: Calculated
For low-pressure gas displacement:			
Propane displacing butane*	75.0	37.4	36.5
Methane displacing butane*	100.0	51.0	50.0
Butane displacing pentane*	11.5	33.7	31.5
Propane displacing butane†	100.0	50.3	49.5
Methane displacing butane†	100.0	56.5	59.3
Butane displacing pentane†	11.5	46.0	46.0
For high-pressure gas displacement:			
Methane displacing propane*	1,300	92.0	93.0
Methane displacing butane*	1,750	85.0	87.0

*Test on unconsolidated sand. †Test on Torpedo sandstone.

bank becomes mixed with the oil. It forms a relatively short mixing zone between undiluted crude and pure solvent. Displacement of the solvent by natural gas can be achieved with complete miscibility (above the critical pressure of the gas-solvent system at reservoir temperature).

Here are conditions that would exist in a typical reservoir injection setup in field operations, according to the authors:

"Between an injection well and an oil well five distinct zones will be present. From the producing well into the reservoir will exist a zone of original oil. This is followed by a zone containing mixtures of oil and L.P.G. In this L.P.G.-oil mixing zone, the concentrations of L.P.G. will increase in the direction of the injection well ultimately grading to pure L.P.G.

"The zone of 100 per cent L.P.G. will be followed by another zone consisting of a mixture of L.P.G. and gas which progressively changes in the direction of the injection well to a point where the hydrocarbon pore space is completely filled with natural gas."

At certain desirable operating pressures, the paper reported, complete miscibility cannot be maintained in displacing the L.P.G. by natural gas. It added:

"If the operating pressure is below the critical pressure for the natural-gas-L.P.G. system at the operating temperature (for example, 1,350 psia. at 100° F. for the case of methane displacing propane), two phases will exist and displacement will be only partially miscible."

The Stanolind team was able to develop precise equations for calculating the recovery performance of both types of drives. The predictions calculated by the equations coincided very closely with actual lab results (see table).

Propane requirements . . . One of the more interesting facets of the "miscible slug" process is the amount of slug required for the displacement.

It was found that the volume needed to maintain a miscible-phase displacement over any well spacing path varies directly with the square root of the path length.

In one lab test a slug equal to 1.5 per cent of the pore space was required to maintain a miscible phase displacement for a 123-ft. length. This meant 70 cc. of liquid propane at 2,900 psi. and 140° F. If the reservoir length were increased by a factor of 9 to 1,107 ft., the slug volume needed over the longer length would be increased to only 210 cc.

That's a reduction in per cent of total pore volume from 1.5 for the 123-ft. core to 0.5 per cent for the 1,107-ft. core.

Drawbacks . . . All is not 100 per cent rosy with the new recovery process, however.

One problem is unfavorable mobility ratios native to a liquid-propane slug or piston. This could mean poor areal sweepout efficiency in many reservoirs. In such cases an ordinary water flood might be just as good.

However, it has been found that major improvements in areal sweepout efficiency can be obtained by reducing the mobility of the gas phase through simultaneous injection of water and gas following the propane.

The injection ratio of gas to water can be chosen so that a small slug of gas (about 5 per cent of the total pore space) is maintained between the propane slug and the water. Such combination of the miscible slug process with a small water drive should result in ultimately sweeping a larger portion of the reservoir by miscible-phase displacement than would be possible with the basic process.

Humble method . . . Humble Oil & Refining Co. also is trying a new secondary-recovery method which is expected to outperform any in general use today.

Its first full-scale tests are in Bronte and Seeligson fields in Texas. Humble research points to 50 per cent greater recovery in Bronte than could be obtained under water flooding (*The Oil and Gas Journal, July 16, page 70*). Generally, Humble feels it can increase recovery to 60 to 100 per cent of original oil in place with the method.

At Seeligson, where one pay will be tested, prospects are for boosting recovery to 475 per cent of that available by primary production (*The Oil and Gas Journal, September 3, page 80*).

Instead of using a gas and liquid in separate phases, Humble injects a rich casinghead gas in a "condensing gas drive." It works like this:

When injected slightly above reservoir pressures, the gas will be highly soluble with the reservoir oil. It will lower viscosity and improve the permeability relationship.

The reservoir oil will actually absorb the gas. It will be washed out of the reservoir. Like the miscible-phase displacement process, the drive is designed to sweep oil from sand particles wherever it makes contact.

Severance Tax Again Is Challenged

DENVER. — Two major oil-producing firms have joined The California Co. in challenging the legality of Colorado's oil severance tax.

Stanolind Oil & Gas Co. and Sinclair Oil & Gas Co. filed suits in Denver District Court last week claiming —like Calco had contended earlier— that the tax is unconstitutional and discriminatory. Stanolind asked return of $158,804 in severance taxes paid. Sinclair asked $39,851.

Calco sued last year to recover $955,328 in taxes paid April 15, 1954, plus interest since that date.

The Colorado Supreme Court recently upheld the firm's right to challenge constitutionality of the tax in Denver District Court. The state had sought to kill the action on grounds the state is immune from suit in its own courts. The suit still is pending.

Stakes are high . . . Although the three cases involve specific sums, the outcome will affect millions of dollars of severance taxes paid to the state by all oil companies operating in Colorado since the levy was first imposed in 1953. It currently yields about $3,000,000 a year.

The levy actually is a gross income tax on oil production. The tax rate is graduated up to 5 per cent, depending on the amount of oil taken from the ground.

Importers Get New Chance

- **Cabinet fuels committee and President favor keeping voluntary controls over imports at least through 1957**
- **Middle East flow of 299,600 bbl. daily recommended; it's only 1 per cent cut on first-half average imports**

WASHINGTON.—Domestic oil producers are finding the odds running against them as they urge the application of formal controls on imports of Middle East crude.

They go into a hearing this week before Charles H. Kendall, general counsel of the Office of Defense Mobilization, faced with overcoming a decision by the cabinet fuels committee. The committee has recommended that the voluntary control program be given one last chance.

The committee called on importers to keep their 1957 entries of Middle East crude down to 299,600 bbl. daily. In light of a 5 per cent increase in domestic production foreseen for next year by the Bureau of Mines that would keep imports within the formula set out in February 1955, it said.

Ike's stand . . . Administration officials pointed out another roadblock in the way of producers.

President Eisenhower endorsed the voluntary program October 12 in calling for a study of a billion-dollar tanker building plan by Mobilization Director Arthur S. Flemming.

Any plan drawn up, the President ordered, must be "consistent with the requests that you (Flemming) have made to oil importers voluntarily to keep imports of crude oil into this country at a level where they do not exceed significantly the proportion that imports bore to the production of domestic crude oil in 1954."

Eisenhower's statement was endorsed by Robert L. Wood, president of the Independent Petroleum Association of America, as "significant and encouraging." But the producer spokesman called the committee report disappointing. He said it still excludes 80 per cent of all imports.

Holds to old formula . . . In a report that will go to the White House, the cabinet committee stood firmly behind its original formula.

If Middle East imports are kept within that rule, importers must keep their entries only 1 per cent under the average of actual imports through the first half of 1956.

The committee definitely made this the final chance for the importers. Flemming conceded that if imports exceed the formula he will have no alternative to setting the wheels in motion for government control.

"Unless this objective is realized there will be in the period immediately ahead an impairment of our national security position because there will be an inadequate incentive for exploration and the discovery of new sources of supply," the committee said.

"Deviation from the above policy reflected in the import programs announced for the third and four quarters of 1956 would constitute, if continued into 1957, a threat to our national security."

Exemptions . . . Imports from Canada and Venezuela will not be included in the base for setting allowable imports.

But Venezuelan officials have assured the State Department their exports, other than to the West Coast, will be kept within the original formula in which they were included as part of the base.

This will call for a cutback of Venezuelan shipments to 405,000 bbl. daily. Actual imports in the second quarter were only 383,000 bbl. daily, but for the current quarter they are scheduled at 427,000 bbl.

The present policy of excluding imports into District 5 will be continued. But the committee ordered that the situation on the West Coast be reviewed periodically to determine whether this exemption should be ended.

"It is clear that the ends of national security would not be served by suggesting restrictions on imports into this area at this time," the report said. "It should be pointed out, however, that from a national security point of view emphasis should be placed on imports into District 5 from Western Hemisphere sources. To this end, appropriate arrangements should be made as rapidly as possible."

Refinery plan dropped . . . The committee also approved Flemming's action in dropping controls on imports of residual fuel oil.

Imports at present or expected levels do not call for regulation, it said. But, again, it held that the situation should be reviewed frequently, to see whether imports have increased to a point where they threaten to supplant domestic residual or impair the production of other fuels.

The decision to stick by the February 1955 formula was reached by the committee after a study of several alternatives, including a proposal to tie imports to refinery runs rather than to crude.

The refinery basis has not been entirely ruled out, Flemming said. But the writing of a satisfactory formula based on throughput and its application in a way that would protect new importers presented so many difficulties that the idea was dropped, for the present at least.

The committee said, however, that it may be possible to devise other methods for controlling imports which, among other things, would "deal more satisfactorily with the problem of how the new importers can be provided with a share in the over-all import relationship."

The committee suggested that producers and importers be invited to present their ideas at the hearing this week. It then will study the suggestions and decide whether any of them can be adopted.

More importers . . . Administration officials apparently expect the number of importers will increase.

They pointed out that competition is driving more companies to import the lower-cost Middle East oil.

By cutting back those companies that have accepted the formula over the past year as well as those who have exceeded their share, the latter mostly from the group of "newcomers," it will be possible to provide a "kitty" to protect others who want to import, it was explained.

"In effect we have been saying to old importers, 'move over and make room for newcomers'," one official said.

Three issues . . . Hearings on the domestic producers' plea for application of the national security clause of the Reciprocal Trade Act boil down to three issues, officials said.

The major questions are:

. . . Does a threat to national security exist?

. . . Can such a threat be removed by individual voluntary action by importers?

. . . Is there a better way of controlling imports?

Legally, neither the cabinet committee nor Flemming has any authority to make any findings leading to formal controls. But if he has reason to believe that imports threaten national security, Flemming must so report to the President. The President then has

absolute power under the Trade Act to adopt any means he finds necessary to control imports, and his order would be law.

Basis for decision . . . The committee's call for a cutback in Middle East imports was based on a finding by its task force that actual imports during the first half of this year averaged 302,600 bbl. daily and those programed for this quarter would average 310,000 bbl.

The recommended level for 1957 or 1 per cent under the first half of 1956 would call for a cutback of 3,000 bbl. from the first-half average. But it would require a cut of 11,000 bbl. from fourth-quarter levels.

Importing companies have been asked to submit plans for all four quarters of 1957 at the hearing or not later than November 8. If these plans conform to the cabinet committee's requirements, the companies will be given a chance to show they can live up to them before further action is taken.

Alberta Tracts Sold

Pembina dominates sale that brings $14,518,311

EDMONTON.—Sale by the Alberta government of petroleum and natural gas leases on 83 parcels of land reaped $14,518,311 recently for the provincial treasury, boosting to nearly $70,000,000 the government take from these sales so far this year.

Once again top-ranking Pembina field set the pace, bringing in $13,116,179 for rights on 28 of the 34 parcels offered. This brought to $90,806,702 the total taken by the government from leases in that field since its discovery in 1953.

The last major sale in May brought the government $33,283,000, of which Pembina accounted for more than $18,000,000.

Ohio Oil Co. offered the highest price for a single parcel at the recent sale—$1,117,122 for 318 acres in Pembina. This was less than half the $2,711,000 paid last May by Triad Oil Co. in that sale's high bid. Ohio also purchased three other parcels, comprising 640 acres, for $1,619,260.

Eleven parcels in proved areas brought $571,760 and 44 wildcat tracts were bought for $830,372.

California Standard Co. was the big bidder of the sale, however. It offered $5,012,036 for rights on 12 Pembina parcels totaling 3,157 acres.

Second high bidder on an individual parcel was Mobil Oil of Canada, Ltd., with a price of $750,117 for 320 acres in Pembina.

watching WASHINGTON

. . . with Bertram F. Linz

Harris to succeed Priest—maybe . . .

THE death of Rep. J. Percy Priest of Tennessee will make Rep. Oren Harris of Arkansas chairman of the House interstate commerce committee next year if the Democrats retain control of Congress.

Harris, who sponsored the Eisenhower-vetoed bill to exempt independent gas producers from Federal Power Commission regulation, has had many years of service on the committee. As a member of the oil subcommittee, much of the time as chairman, he has had continuous close contact with the industry.

The Arkansas congressman will be 53 next December 20. He was elected to the House in 1940. He served first on the committees on invalid pensions, merchant marine and fisheries, and public buildings and grounds. In 1943 he was given posts on the more important commerce committee and the District of Columbia committee, which he still serves.

Rep. Priest was elected to Congress in the same year as Harris. He, too, went on the commerce committee in 1943. But, named just ahead of Harris, he reached the top of the ladder first. He became chairman of the committee when the Democrats won control of Congress in 1955.

Unchanged melody . . .

THERE will be no change in wildlife-area leasing policies under Interior Secretary Fred A. Seaton.

More leases have been granted on refuges since 1953 than between 1947 and that date, Seaton admitted in his first public discussion of the matter. But there were 3 years of Korean war controls in the earlier period. And 82 of the leases granted in the past 3 years were in two areas—53 in the Railroad Valley area of Nevada, which proved a flop, and 29 in the Kenai Moose Range in Alaska, where each moose still has about 1,000 acres on which to sulk.

It is just "common sense" to permit oil development in wildlife areas so long as it is properly managed and there is no danger to fish and birds, Seaton says. And there could be circumstances where drilling might even be permitted in the national parks. But the secretary said he would want to take a long look at the applications. Anyway, none have come in to the department so far.

Cold storage for Suez plan . . .

NEW prospects for a peaceful solution of the Suez Canal problem may result in the government-industry "plan of action" being shelved. But it will be kept fresh and clean for quick use if parleys between Egypt and the western powers break down.

There are no signs now that the movement of oil through the canal will be interrupted. Egypt thus far has operated the canal by itself, with no more than the usual minor difficulties.

The U. S. Government, nevertheless, is taking precautions. The Navy is reactivating eight reserve tankers and later will bring 13 fleet oilers back into service. And Mobilization Director Arthur S. Flemming, at the direction of President Eisenhower, met last week with other government officials and representatives of the oil industry to talk about a plan to build 50 large tankers which would bypass the canal (see page 72).

Many in Government and the petroleum industry view such an addition to the U. S. tanker fleet as a much-needed step. Even if the present crisis passes without having any crippling effect on Middle East shipments, they reason, tomorrow's another day. From their standpoint, an ounce of preparedness wouldn't do any harm—just in case.

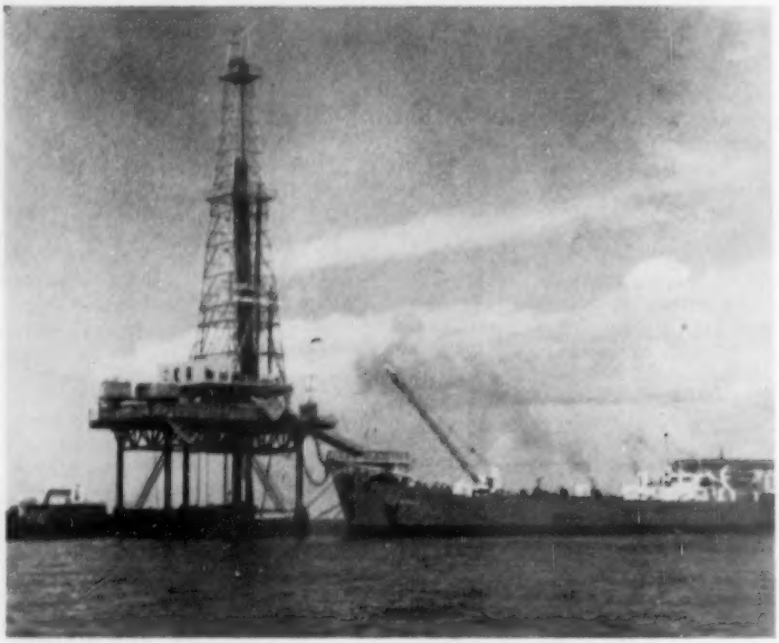
First permit in months issued . . .

. . . Apco Rig Breaks Calm Off Louisiana

NEW ORLEANS.—Drilling resumed on a limited scale in the disputed tidelands off Louisiana last week following a temporary settlement between the state and the federal Government.

Anderson - Prichard Oil Corp., the first to get a drilling permit under the truce terms, started to work immediately on a lease where idle equipment had cost the company about $400,000 during the long shutdown.

Other companies expected a short delay—perhaps ranging up to a week or 10 days—in getting the required permits to resume operations in the disputed area. Drilling of new wells had been banned more than 4 months by a Supreme Court order affecting the wide belt where both the U. S. and Louisiana claim jurisdiction.



WITHIN 24 HOURS after a permit was issued, Apco had spudded in this wildcat. The tender, hooked up less than 4 hours after the permit was received, had been idle since it was christened last summer.

Apco moved fast . . . Anderson-Prichard wasted little time diving back into the disputed waters from which it had been barred.

Having gone all the way to the Supreme Court in an unsuccessful attempt to get a drilling permit during the shutdown, Anderson-Prichard had all necessary papers drawn up for quick signing after the truce was announced.

The company was granted a drilling permit by the U. S. Geological Survey and the Louisiana Department of Conservation on the morning of October 15. By noon that day a tender was being hooked to the drilling platform in Block 39, East Cameron area. The long-postponed well was spudded about 8 a.m. the following day, and by 11:30 a.m. it was down to 200 ft.

Deepwater Exploration Co., Houston, has the drilling contract for the first well under the new joint-jurisdiction agreement. The platform and rig had been sitting idle during most of the long negotiations over control of the disputed area. The contractor is using its No. 1 tender, which was christened in Florida last summer soon after the Supreme Court issued its shutdown order. This is its first assignment.

Anderson - Prichard was paying $4,400 a day under the drilling contract while trying to get a permit to start the first well in Block 39. The initial wildcat, projected to 14,000 ft., is on a 1,250-acre lease.

This is one of six Anderson-Prichard leases which were originally granted to Stanolind Oil & Gas Co. by Louisiana several years ago. Later, after passage of the Submerged Lands Act of 1953, the U. S. Interior Department ratified the leases. They cover about 8,500 acres.

In addition to the payment for idle drilling equipment, Anderson-Prichard has been paying double rental on the disputed leases. Payments have been going to both the state and the federal Government.

Anderson - Prichard originally requested a drilling permit for Block 39 last June 11, the day the Supreme Court handed down the shutdown order. The drilling contract had been let several weeks before that date. It provided for spudding of the first well on or before July 15.

After being denied a permit, the company appealed to Justice Hugo Black of the U. S. Supreme Court for relief from the court order. This was denied, and the company then appealed to a lower federal court with similar results.

Leases may be lost . . . Even with resumption of normal operations in the disputed area several companies are in danger of losing leases because of failure to drill. Louisiana recognizes December 28 as the original expiration date for Anderson-Prichard's contested leases. According to the Interior Department's calculations, the leases would stay in effect until next March 13.

The federal-state truce provides for extension of leases affected by the 4-month moratorium, but it fails to specify how long the extension will be. Under a recent interpretation by the solicitor of the Interior Department it is generally assumed leases will be extended for the length of the shutdown.

While Anderson-Prichard was making hole in the disputed area about 30 other companies were working feverishly to get the necessary papers in order so they could apply for permits. Whereas Anderson - Prichard had six leases to be cleared, other operators had up to 10 times that many.

Louisiana at work . . . State Attorney Gen. Jack Gremillion and the State Mineral Board met late in the week to determine the procedure for issuing new permits.

Under the truce agreement signed in Washington October 12 approval of both the federal and state governments is required before an offshore operator can start new wells in the disputed area *(The Oil and Gas Journal, October 15, page 84).*

The area where U. S. and state claims overlap covers about 700,000 acres. The boundary question is now pending before the Supreme Court.

New Products Barge

Vessel to transport cargo of 26-lb. natural gasoline

BEAUMONT, Tex.—Warren Petroleum Corp. will soon be moving 26-lb. natural gasoline by barge.

The company last week launched the "City of Houston," the first vessel designed for that purpose. It will serve refineries along the gulf intracoastal canal and inland waterways. It is not designed for ocean service.

Natural-gasoline capacity is 18,000 bbl. Three other types of products can be transported at the same time. The barge is 210 ft. long, 44 ft. wide, and 13 ft. high. It will draw approximately 2 ft. of water when empty and 9½ ft. fully loaded.

S. I. Hulse, Warren vice president, said the City of Houston will not operate on a specific route, but that "it will go where and when it is needed."

The decision to build it, he said, was prompted in part by rising tank-car rates. Barges are used to transport 14-lb. natural gasoline, but the higher-pressure version has been moved by tank car or pipeline.

The City of Houston was built in the Beaumont Shipyards of Bethlehem Steel Co. The hull design was model-tested in the towing basin of the University of Michigan to obtain the most efficient lines.

New Firm Opens Refinery

LOVELL, Wyo.—Newly-formed Big Horn Refining Co. has acquired Ohio Oil Co.'s 6,000-bbl. refinery here and put the plant back on stream. It had been shut down earlier this year.

The refinery is processing 5,500 bbl. daily of high-asphalt crude from Hamilton Dome field. Some 40 per cent of production is asphalt, with diesel fuel, gasoline, and kerosine making up the rest.

Elbert O. Sowerwine, Jr., formerly with Husky Oil Corp., is president of Big Horn. The firm was organized by a group of Wyoming, Montana, and Eastern investors. Sowerwine, of Cody, and H. O. Batzer, of Thermopolis, both in Wyoming, are reportedly the biggest stockholders.

Sunray Building New Plant

TULSA.—Sunray Mid-Continent Oil Co. will build and operate a 17,500 M.c.f. daily field processing plant near Carney in Lincoln County, Oklahoma.

The new plant will process natural gas gathered principally in the East Victor field by Jernigan and Morgan pipeline and McRae Oil & Gas Co. The dry gas will be returned to Cities Service Gas Co. lines in Lincoln County for transportation to market. Sunray Mid-Continent will market the propane, butane, and natural-gasoline products.

Tuloma Builders of Tulsa is prefabricating the plant. It is being designed to keep construction investment at a minimum and to require only a skeleton force for operation and maintenance. Operations are expected to start April 1.

Citronelle Taxes City Wells

CITRONELLE, Ala.—A severance tax of 3 cents per barrel has been levied by the Citronelle town council on oil produced within the town limits.

The council also has set a tax of 1 cent per barrel on oil produced outside the town but within its police jurisdiction.

Citronelle is in the heart of the 1-year-old Citronelle oil field, which has 44 producers. Sixteen are within the town limits and 28 are outside.

Z. B. Skinner, Jr., town attorney, estimates the new revenue will total $40,000 to $50,000 a year. The field currently is producing about 150,000 bbl. of oil per month.

Casper Refinery to Expand

CASPER, Wyo.—Socony-Vacuum Oil Co. is installing a catalytic reformer and hydrodesulfurizing unit at its 8,100-bbl. refinery here.

The catalytic reformer will have a throughput of 3,250 bbl. daily and will convert heavy naphthas into gasoline exceeding 100 octane. The hydrodesulfurizer will remove sulfur from heating fuels and diesel oil processed from high-sulfur-content Wyoming crude. This facility will use hydrogen from the catalytic reformer.

Both units are scheduled to go on stream by the fall of 1957. Contractor is J. M. Pritchard Construction Co., Kansas City.

Tank-Car Orders Piling Up

WASHINGTON. — New tank cars delivered in September totaled 628, but the backlog of orders continued to mount.

Car builders received new orders for 643 liquid carriers, according to the American Car Railway Institute.

At the September rate of output, the backlog of orders could not be wiped out for more than a year. On October 1 undelivered tank cars on order totaled 7,628, the institute said.

Reservation Leased

Blackfoot council favors development by single firm

BROWNING, Mont.—The tribal council representing 5,200 Indians living on the Blackfoot Reservation in Montana has voted to turn over to a single company full control, management, and development of tribal oil lands.

The company is composed of Cardinal Drilling Co., Bismarck, N. D.; W. R. McDonald, Browning; J. L. McLaughlin, Great Falls, Mont.; Thornton Davis, San Antonio, Tex., and Wilfred Nadeau, Cut Bank, Mont.

The agreement, subject to approval by the Secretary of the Interior, would be for a period of 3 to 20 years and would cover the reservation's 1,500,000 acres.

The tribe would receive 12½ per cent royalty before drilling costs. Excess profits would be divided equally by the tribe and the company.

The council said it agreed to the contract because of the tribe's lack of scientific knowledge "necessary for the proper, efficient and economical evaluation, supervision, and management of oil and gas lands."

Washington must act . . . Interior officials said in Washington the Blackfoot agreement has not yet been received. But an official in the Bureau of Indian Affairs pointed out that department policy requires competitive bidding on leasing of any Indian reservation land. He said the Blackfoot agreement will be studied to determine if it conforms.

Interior Secretary Fred A. Seaton recently rejected a 5,365,000-acre exploration contract between Delhi-Taylor Oil Co. and the Navajo Indian tribe because other oil companies were not invited to bid on the deal *(The Oil and Gas Journal, July 30, page 121)*.

P.G.&E. Plans Gas Line

EUREKA, Calif.—A 200-mile, 12-in. gas-transmission line will be built by Pacific Gas & Electric Co. from Sacramento Valley to Humboldt County on the north coast of California.

The gas line, to cost $9,500,000, is to be laid next year across the mountains to bring 20,000,000 cu. ft. daily to the Eureka area. Construction is to start early in 1957. Completion is due by December 1.

The line will quadruple natural gas supplies now available to Humboldt County users who now rely on the local Tompkins Hill field.

Tankers even bigger than this are in the wind as Washington talks in terms of a . . .

New Billion-Dollar U.S. Tanker Fleet

WASHINGTON.—With an eye to the future, the Government is studying a billion-dollar tanker fleet which could take up the slack in transportation if access to the Suez Canal were cut off.

The basic framework of a program to build around 50 large tankers over the next few years was laid down by President Eisenhower in a directive to Mobilization Director Arthur B. Flemming.

The program, Eisenhower said, should "provide for the building in United States shipyards of a sufficient number of large tankers to supplement means of transportation and, if necessary, to help serve as an alternative in the transportation of oil in the free world, particularly from the Middle East."

Contracts for building the vessels could be made by the Government under the Defense Production Act. And the Government itself would buy such tankers as were not purchased by private shipowners.

The exact number of tankers to be built was not set by the President. But he said there should be enough to meet the Government's full emergency requirements.

Flemming was directed to meet immediately with representatives of the NPC and the secretaries of Defense, Interior, Treasury, State and Commerce "to consider plans that will be helpful in assuring the efficiency and adequacy of the distribution of petroleum supplies in the foreseeable future in the free world."

Notice to Nasser . . . The program is not designed to meet the present Suez Canal situation. But Egypt's seizure of the waterway has focused attention on the possibility of a future actual closing of the canal.

Even if the present problem of supervision of canal operations is solved, however, the trend toward larger tankers will materially lessen the value in years to come and make necessary the use of the longer alternative route around the Cape of Good Hope.

Officials concede, however, that the President's order might be construed as a warning to Egypt that the canal is not indispensable and must be operated to the satisfaction of the maritime nations if it is to retain their favor.

Mobilization officials emphasized that the President's interest in the tanker-building program has not committed the Government to the program. It is a long-range project for which plans will be drafted and studied. After that, a decision will be made whether to go ahead.

Since the project is still unplanned, Flemming said neither the number nor size of the vessels had been fixed. He said, however, that there might be 50 tankers considered. He would not estimate the cost of the program, but said a 60,000-ton tanker would cost about $18 million.

Old plan in new dress . . . While the new program is proposed at a time of tension in the Middle East, the Government has been trying for years to encourage expansion of our tanker fleet.

As far back as 1951 the Maritime Administration offered to permit the transfer of tankers to friendly foreign nations if their owners would build new ships. So far it has approved the transfer of 46 in return for the building of 16 of the same or greater carrying capacity.

The ODM set up an expansion goal of 100 ocean-going tankers in 1952. So far 22 ships have been built or started with tax amortization and certificates granted for 5 others. In the same period 68 tankers have been built or started without quick write-off grants.

A law passed by Congress in 1954 also set up the "trade-in-and-build" plan under which the Government takes over old tankers and makes an

allowance toward the building of new ones. But economic conditions over the past 22 months have been so favorable that owners are financially better off to keep vessels in operation rather than take the trade-in allowances. As a result, only 14 T2 tankers have been traded in on the building of 6 larger ships.

The Military Sea Transportation Service also has been trying since 1954 to secure the building of 15 new tankers for 10-year charter to the government. This is part of a 20-tanker program approved by Congress. The Government itself was to build 5 of the tankers. But Congress provided funds sufficient for only 4 ships, for which contracts have been let. No contracts have yet been made for the 15 charter vessels.

Today's picture . . . There were 338 commercial tankers of 5,667,000 deadweight tons in active service last June 30. Another 12 totaling 399,050 dwt. were building for delivery by next September 30, and there were 18 T2's totaling 298,200 tons in the national defense reserve fleet.

The U. S. flag fleet, however, is supplemented by 237 tankers aggregating 4,434,019 dwt. under Panamanian, Liberian, Honduran, or Venezuelan registry.

Eight of the T2 tankers in the reserve fleet are now being reactivated to free commercial markets. They will be operated for the MSTS by 3 civilian shipping companies, the Joshua Hendy Corp. of Los Angeles, Methiason's Tanker Industries, Inc., of Philadelphia, and the Marine Transport Lines of New York.

The Navy later will reactivate 13 fleet oilers which will be manned by Navy personnel.

New uses opening . . . Government interest in tankers has been spurred not only by the Suez crisis but as well by two other developments, and the prospect of a third.

One such development is a new use for tankers to carry grain. A considerable number of grain cargoes have been lifted successfully, it was disclosed by an official of the Federal Maritime Board.

Plans also have been offered for use of tankers to carry cased cargoes.

And within the next 5 years new routes for tankers may open up with the completion of the St. Lawrence Seaway. This billion-dollar project will make it possible for ocean-going ships of 27 ft. draft to sail up the St. Lawrence River into the Great Lakes to supply refineries that will be built along the waterway.

Processing BRIEFS

Imperial Oil Co., Ltd.'s completely rebuilt Imperoyal Refinery at Halifax, N. S., was officially opened this month by Nova Scotia's Premier Henry D. Hicks. Capacity of the plant was increased from 18,000 bbl. to 42,000 bbl. in one of the biggest projects of its kind in the history of the province. Docks serving the harbor-site plant were also enlarged.

Imperoyal processes Caribbean crude brought in by tanker. The refinery breaks the crude down into 47 products, ranging from heavy asphalt to gasoline. The $30,000,000 facility covers 616 acres and has harbor frontage of 4,840 ft. Rebuilding started in early 1955.

Sunset International Petroleum Corp., Los Angeles, has awarded a $200,000 contract to Southern Engineering & Construction Co., Long Beach, for expansion of thermal cracking facilities at its Torrance refinery. The new facilities will boost the 9,000-bbl. refinery's thermal cracking capacity from 3,200 bbl. daily to 4,200 bbl. daily.

Another new building named for an oil company—The Canadian Oil Building—is being built in Toronto. Canadian Oil Companies, Ltd., will lease the four top floors for its new headquarters. The company expects to move into the building next July.

Some historic landmarks at Esso Standard Oil Co.'s Bayonne, N. J., refinery are giving way to progress.

Ten large wax sweaters have just been shut down, their deoiling work replaced by the addition of new filters on the M.E.K. unit. They were built in 1909 and at one time 54 operators ran 25 of the now obsolete units.

A new caustic treater will be built to replace agitators used in treating heating oil. The agitators, once standard equipment in every refinery, were built in 1907.

Wainwright Producers & Refining, Ltd., subsidiary of American Northland Oil Co., San Francisco, plans to expand its 3,000-bbl. daily refinery recently started up at Wainwright, Alberta. The company said details would be disclosed in 2 or 3 months.

Some of the wells in the area have been producing for 30 years, and 59 others were drilled last year to supply the refinery. The total included 53 oil producers, 2 gas wells, and 4 dry holes.

Ethylene glycol and methanol, derived from coal and natural gas, will be blended and packaged in Olin Mathieson Chemical Corp.'s $1.5 million plant to be built at Mapleton, Ill., 10 miles south of Peoria. The products will come from Morgantown, W. Va., Brandenburg, Ky., and Gulf Coast plants.

Stanolind Oil & Gas Co. has completed and is operating a new sulfur-recovery unit at its Midland Farms natural-gasoline plant near Odessa, Tex. The unit extracts elemental sulfur from hydrogen sulfide removed from sour gas produced primarily by the Grayburg formation in Midland Farms.

A new polyol production unit at Bishop, Tex., is planned by Celanese Corp. of America. The company said output would meet the increased demand for trimethylolpropane in the growing polyurethane plastics and coatings field. The unit will use special aldoling processes developed by Celanese. Completion is scheduled by the fall of 1957.

Also for Refiners . . .

Refiners are taking a close look at gas chromatography, which is now ready to move out of the laboratory into refining and petrochemical plants (P. 62) . . . Tidewater has completed a big gas-processing plant at its Associated, Calif., refinery (P. 64) . . . Grace has acquired a process for irradiating polyethylene; will use it in plant going up at Baton Rouge (P. 65) . . . New firm will reopen Wyoming refinery acquired from Ohio Oil . . . Sunray plans field processing plant in Oklahoma with minimum of operating and maintenance force . . . Socony will add two units to Casper refinery (P. 71) . . . World's biggest hydrogen-treating unit and cat reformer are nearing completiton at Tidewater's Delaware City refinery (P. 82) . . . Petrofina plans 20,000-bbl. refinery in West Germany (P. 84) . . . Esso will build 100,000-bbl. refinery in Welsh fishing village (P. 88).

PLUS THESE TECHNICAL FEATURES: How to get stream analyses quickly (P. 94) . . . Preparing for and executing a catalytic-cracker turnaround (P. 100) . . . Continuous corrosion tester is developed (P. 103) . . . Tower temperatures affect products (P. 129) . . . Which paint system to use (P. 131) . . . and W. L. Nelson comments on confused classifying of West Texas oils, effect of base of oil on pour point of diesel fuels (P. 133 and P. 135).

Paradox Crude Finds an Outlet

SAN FRANCISCO. — A 600-mile crude pipeline to transport oil from the booming Four Corners area of Arizona, Utah, New Mexico, and Colorado to Los Angeles is being planned by Shell Oil Co. and Standard Oil Co. of California.

Tentative engineering studies indicate a 14-in. line with initial capacity of 50,000 bbl. daily may be built. This capacity could be doubled by additional pumping stations.

Route of the line would run southwest from Four Corners, north of Flagstaff and Kingman, Ariz., and across the Mojave Desert to the Los Angeles refining center. The route crosses an area which is arid and almost uninhabited.

Such a line has been talked for several months and a similar proposal was made last month by Robert O. Anderson, president of Malco Refineries, Inc., *(The Oil and Gas Journal, September 10, page 83)*. Malco, and other companies as well, will probably share in ownership of the line. The Santa Fe Railway would like to have an interest in return for use of its right-of-way.

Actual construction would take close to 2 years. It would include an extensive gathering system in the Four Corners area.

Prospective reserves . . . Production in the Paradox basin area is still only a few thousand barrels a day, with many wells producing only a fraction of their potential because there is no market.

Action on a line from the region has been spurred recently by major discoveries at Aneth in southeastern Utah and Bisti in northwestern New Mexico.

"Indications are that a new province has been discovered in the Four Corners area with the probability that adequate reserves will be available to support such a pipeline project," it was announced by H. S. M. Burns, president of Shell, and T. S. Petersen, president of California Standard.

"Since California's production is short of meeting demands, this new source would be vitally important in supplementing California's crude supply."

Other outlets . . . Earlier there was pessimism concerning development of the new area because of the limited market available in the immediate future.

El Paso Natural Gas Products Co.'s 3,000-bbl. Prewitt, N. M., refinery is the only market for present Bisti production. El Paso expects to have a 6,500-bbl. refinery ready to go on stream next fall to operate on Bisti crude.

Northwest Pipeline Corp., affiliate of Pacific Northwest Pipeline Corp., is planning a crude-products line from Four Corners to the Salt Lake City refining area for completion also next fall. Capacity would be 15,000 to 25,000 bbl. daily.

These outlets, opening up a year ahead of the line to Los Angeles, would stimulate development around the new discoveries.

Fair Field Prices Revived

WASHINGTON.—The Supreme Court will be asked to take another look at the Panhandle "fair field price" case.

The court refused earlier this month to review the decision of the District of Columbia Appeals Court requiring that the Federal Power Commission use both the traditional cost of facilities basis and commodity value in setting the price for gas produced by Panhandle Eastern Pipe Line Co. *(The Oil and Gas Journal, October 15, page 87)*.

Panhandle has asked for a stay of the Supreme Court's order. It will ask for a rehearing at which, officials say, they will bring in new evidence to show that the FPC acted properly in granting a fair field price for gas produced by the pipeline company.

The FPC has tried to get away from the traditional method of basing rates on the cost of facilities used. But the Circuit Court held it must use cost as a starting point, although not the sole basis for arriving at rates.

New Offshore Fuss?

Alabama to hold auction of leases outside 3-mile zone

MONTGOMERY, Ala.—Alabama is making a determined effort to get into the squabble over offshore boundaries.

The Department of Conservation announced that oil and gas leases on about 232,963 acres under the Gulf of Mexico and Mississippi Sound will be offered at auction here December 20.

Most of the acreage has already been offered—aud turned down—in at least one auction. Much of it has been on the auction block twice within the past 8 months without receiving an acceptable bid.

Tracts offered in the December proposed sale extend as far as 9 miles from the Alabama coast. Under the Submerged Lands Act of 1953, Alabama's boundary generally has been recognized as 3 miles from shore.

The Alabama Legislature earlier this year passed a law declaring the state's gulfward boundary to be 6 leagues (about 20 miles) from the coast *(The Oil and Gas Journal, March 12, page 89)*. So far, this law has caused little concern in Washington because the state has not granted a lease beyond the 3-mile mark.

Alcohol Blend Premature

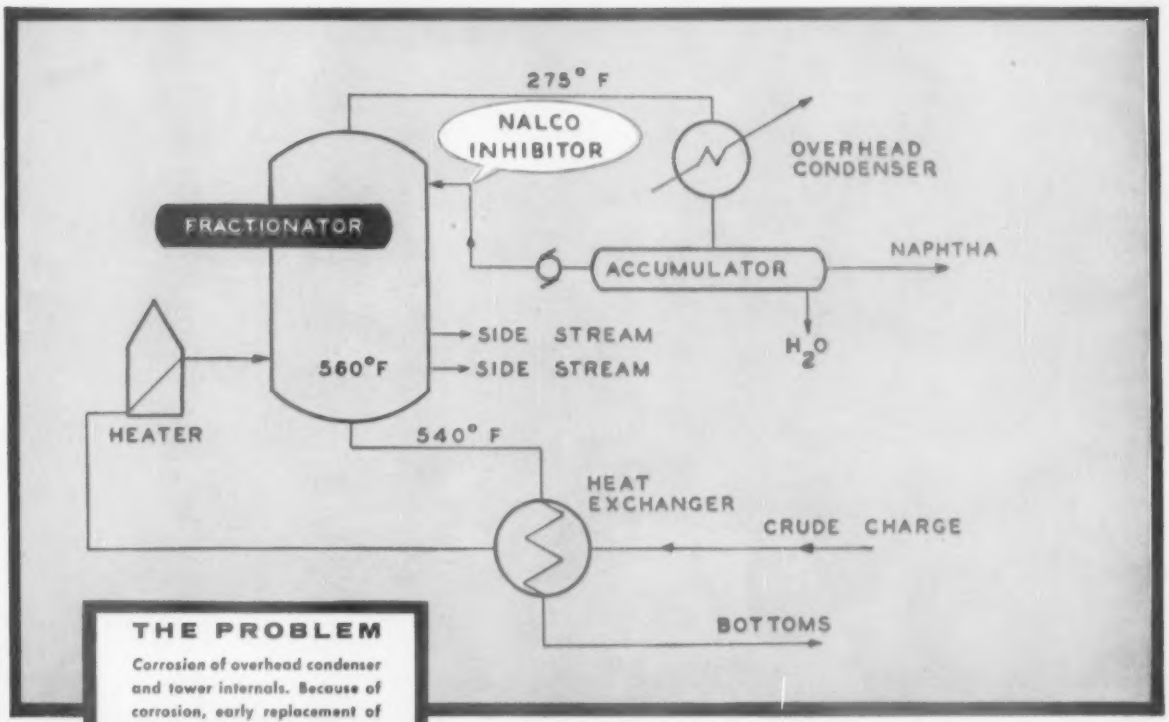
WASHINGTON.—The idea of using surplus crops to make alcohol to blend with gasoline seems to be in the same class as synthetic liquid fuels from coal — an ace in the hole for the future.

Both are possible. But the economics of today don't lend themselves to their adoption.

The Agriculture Department earlier this year said that alcohol couldn't be produced cheaply enough to make a blend commercially successful. This month, members of the President's farm commission studied the question at the department's Peoria research laboratory. They agreed with the department.

But just to make sure, a task force with oil-industry representation will be set up to dig into the possibilities of industrial alcohol uses.

HOW *Nalco* INHIBITORS CUT DOWNTIME 74% ... AND SAVED THIS FRACTIONATING TOWER



THE PROBLEM

Corrosion of overhead condenser and tower internals. Because of corrosion, early replacement of the tower was contemplated.

THE TREATMENT

Nalco Corrosion and Fouling Inhibitor applied into overhead reflux.

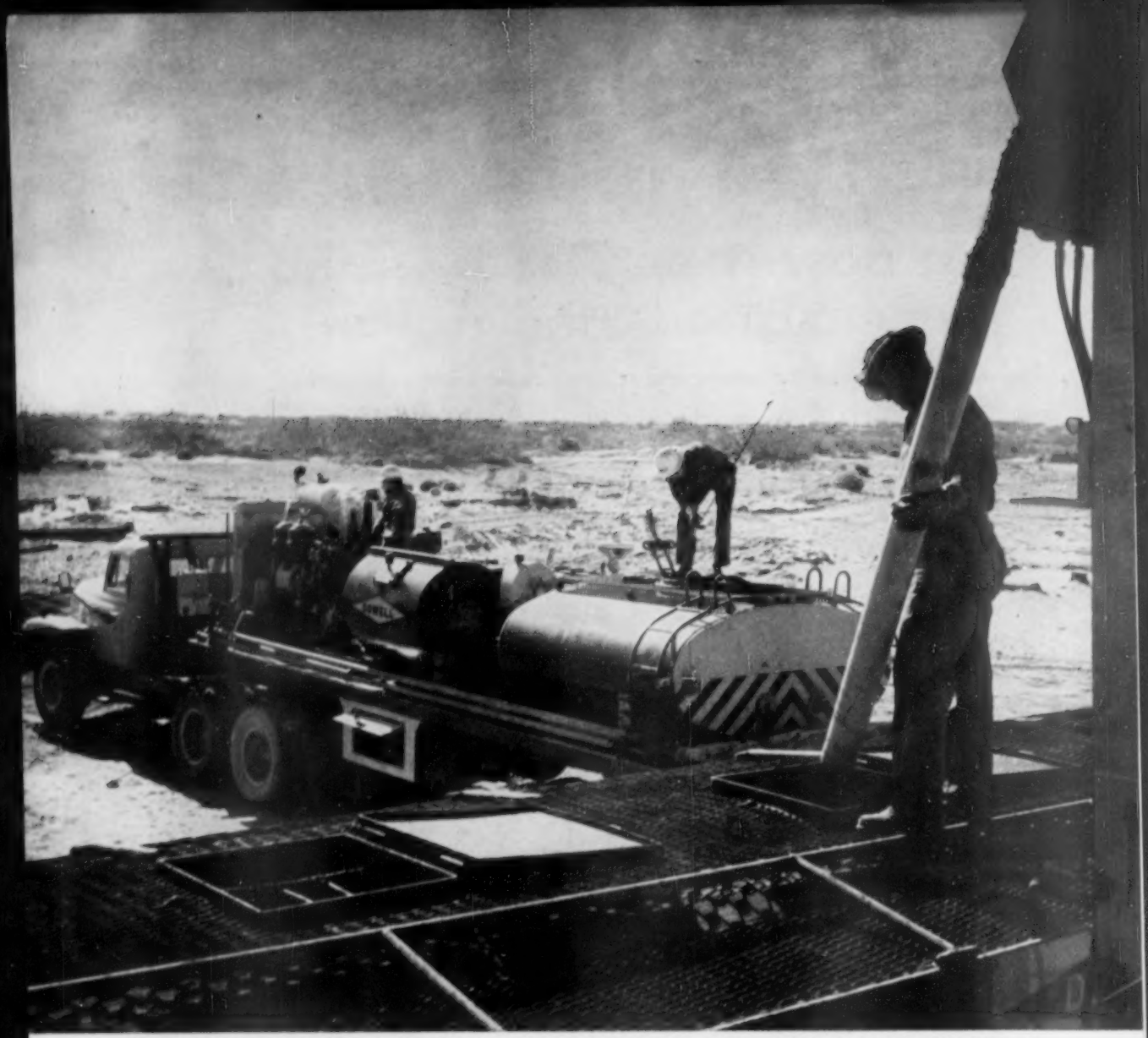
THE RESULT

In this case only one point of application protected both fractionator and overhead equipment. Iron in accumulator water brought below 0.5 ppm as compared to previous 100-150 ppm. Corrosion and plugging stopped, tower saved, and downtime for cleaning reduced by 74%.

EFFECTIVE Nalco corrosion control is very low-cost protection. For example, this refinery not only avoided the cost of a new tower, but cleaner tower internals actually resulted in better fractionation and higher quality products. If you would like further facts on Nalco Corrosion and Fouling Inhibitors, ask your Nalco Representative or write direct.

NATIONAL ALUMINATE CORPORATION
6242 West 66th Place • Chicago 38, Illinois
Telephone: POrtsmouth 7-7240
CANADA: Alchem Limited, Burlington, Ontario
NORTHWESTERN UNITED STATES, HAWAII and ALASKA
The Flex Company, Inc., Minneapolis 3, Minnesota
ITALY: Nalco Italiana, S.p.A.
WEST GERMANY: Deutsche Nalco-Chemie GmbH
SPAIN: Nalco Espanola, S.A.

THE *Nalco*® SYSTEM ... SERVING INDUSTRY THROUGH PRACTICAL APPLIED SCIENCE



DOWELL ENGINEERS PUMP THICKENED INHIBITED ACID AND SAND INTO PAY FORMATION TO BOOST OIL PRODUCTION TWO WAYS.

Two-way attack increases permeability

FRAC ACID* is a Dowell-developed treatment that uses a two-way attack. It combines all the dissolving power of acidizing with the channel-opening effectiveness of fracturing.

Treatment results have been outstanding. For example, in one field each of three new off-set wells was given a different type of treatment. The first was acidized, the second was acidized and then fractured while the third received a double-action Frac Acid treatment by Dowell.

What happened? After the treatments, Well No. 1 made 90 BOPD, Well No. 2 made 240 BOPD. But Well No. 3, the Frac Acid treated well, made 740 BOPD.

Dowell engineers tailor Frac Acid treatments to give you the best possible results. When necessary, additives are used — to reduce surface tension, to control emulsions or silicates, or to intensify acid action.

Frac Acid fluid returns to the well bore quickly, too. After completion of the treatment it breaks down fast, becoming water-thin.

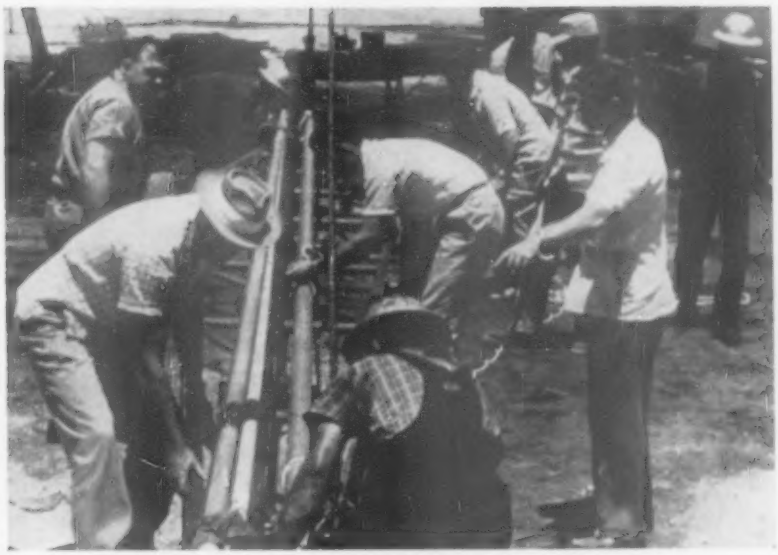
For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write to Dowell Incorporated, Tulsa 1, Oklahoma, Dept. J-11.

*Service Mark of Dowell Incorporated

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY



SHORTY PULLING UNIT has to handle job in sections to run . . .

Record-Length Subsurface Pump

DALLAS.—A reported record-length subsurface pump has been run in a dual Devonian-Ellenburger well near Seminole in Gaines County, West Texas. It has more than doubled production.

The pump is an 80-ft. double-displacement rod type turned out by Harbison-Fischer of Fort Worth. It was run by Samedan Oil Corp. of Ardmore, Okla., in its Andrews D&E 1E.

The Devonian flows through the casing-tubing annulus from perforations at 10,030-66 ft. Operator is pumping the Ellenburger, heavily cut with water, from 11,955-88 ft. through 2½-in. tubing.

With traveling barrel and two 2½-in. chambers, one above each plunger, the new long pump discharges considerably more fluid than a conventional pump with the same barrel diameter and stroke length.

The results . . . It is pumping 775 bbl. of fluid daily—220 of it oil. The pump it replaced was pumping 90 bbl. of oil and 290 bbl. of water daily. The same pumping unit, a big hydraulic type, is being used. It is operating at four and one-half 26-ft. strokes per minute on the 80-ft. pump, compared to five 26-ft. strokes per minute on the replaced unit.

The string-bean, double-displacement pump was run in sections since Samedan didn't have a pulling unit available which was tall enough to handle it. It was set at 6,000 ft.

The replaced pump was set at 9,000 ft. It was a metal-to-metal, 40-ft.-long, sectional-liner rod pump with a 1¾-in. chamber.

Operator decided on the long rod pump rather than a larger-diameter tubing type to avoid the expense of pulling the long string of tubing. The well is completed with a single packer set between the two producing zones. Rod string includes 3,850 ft. of ⅞-in., 2,150 ft. of 1-in., and 35 ft. of 1½-in. stainless-steel polish rod.

Previous record length of a downhole pump was reported at 60 ft.

Greater FPC Control Asked

WASHINGTON. — North Dakota officials want the Federal Power Commission to fix prices for the intrastate as well as the interstate sale of gas.

The state and its public service commission have asked the Eighth Circuit Court of Appeals to review an FPC order approving purchase by the Montana-Dakota Utilities Co. of gas from Amerada Petroleum Corp. and Signal Oil & Gas Co. at Tioga, N. D.

The FPC passed on a price of 9 cents per M.c.f. for "dump" gas which could be bought for interstate transportation. However, it refused to act on a higher price of 16 cents per M.c.f. contained in "firm gas" contracts. FPC held the higher-priced gas was to be produced, sold, and consumed within the state, and it has no jurisdiction over intrastate sales.

The North Dakota officials contended the FPC should have taken jurisdiction over all the gas involved. They argue it should have required that the gas sold for transportation and resale within the state carry no higher a price than the rest of the gas.

Williston Upgraded

Outlook for basin is still bright, geologists report

BISMARCK, N. D.—The Williston basin has settled down from its initial oil boom to steady development. But geologists still consider the region one of the best undeveloped sedimentary basins in North America in which to hunt for oil and gas.

That's the consensus of nearly 400 geologists who gathered here for the first international Williston basin geological symposium. It was sponsored jointly by the North Dakota and Saskatchewan geological societies, and attracted oil explorers from the Williston, Rocky Mountains and Mid-Continent regions.

Dr. Wilson M. Laird, state geologist of North Dakota, predicted that much additional oil will be found in the Williston as a result of the present steady development program.

He admitted the initial boom is over and warned "we may still expect many disappointments because oil finding is still far from a sure thing." He said that many problems solved in the past will help oil men explore the full potential of the basin.

The balance sheet . . . Kye Trout, Jr., petroleum engineer and geologist of Beach, N. D., toted up the economic balance sheet after 5 years of exploration and drilling in the basin.

He said the region now stands in a competitive position with other active oil and gas provinces on the continent because of these factors:

. . . **Drilling costs** have dropped to compare favorably with other basins of similar depths.

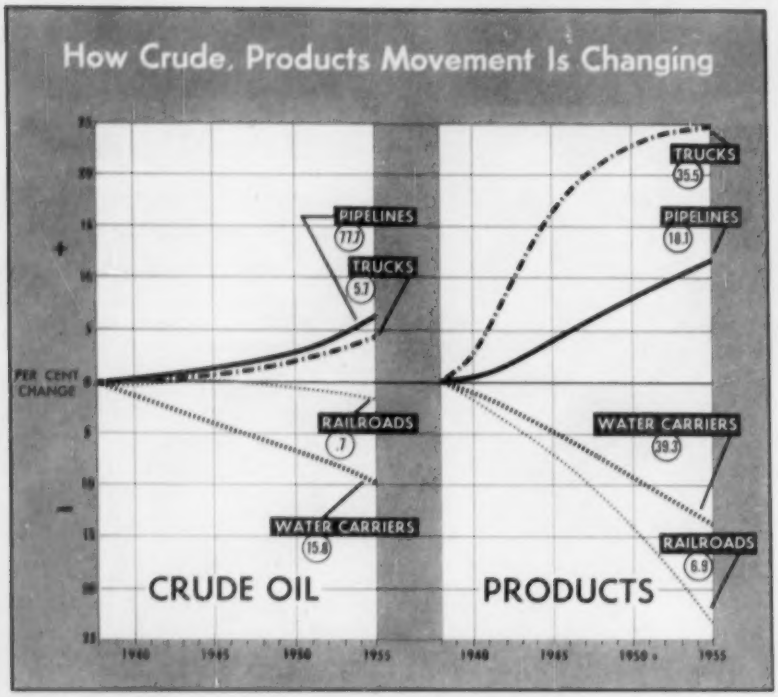
. . . **Drilling problems** have been reduced until only a few trouble spots remain.

. . . **Oil marketing** from the basin has improved since 1952.

. . . **Payoff on investment** is now varying from 3 for 1 to as high as 8 for 1.

Hottest area . . . The basin's biggest current drilling play in under way in Southeast Saskatchewan.

Paul Vogt of Imperial Oil, Ltd., Regina, told the symposium that exploratory drilling after discovery of Alida field in Saskatchewan has uncovered similar-type fields and proved reserves now totaling nearly 100,000,000 bbl.



PETROLEUM TRANSPORTATION CHANGES show rise of pipelines and trucks, relative decline of water carriers and railroads. Charts show shifts in share of total crude and products handled, disregarding distance hauled.

Pipeline Use Grows

Pipelines, trucks gain as carriers of crude and products while barges and tankers' relative position is declining

PIPELINES are moving a bigger share of crude in domestic transportation than at any other time in history, save for the war year of 1944.

They're also gaining in products transportation, while domestic barge and tanker traffic of crude and products is continuing the percentage decline which started several years ago.

Truck movement of both crude and products is at an all-time high. Railroads, meanwhile, have practically vanished from the crude-hauling business and their share of the products business is the smallest in the modern history of the industry.

These pronounced shifts in petroleum transporation were pointed up in a report by the Committee for Oil Pipe Lines, Washington, D. C.

Shipments are reported in tons only and do not take into account the distance moved. Truck shipments are generally short hauls while those by pipeline and water carriers are much longer.

Crude transportation . . . Pipelines, which have always dominated crude transportation, strengthened their position last year for the seventh straight year.

Total crude shipments were 398,877,036 tons. Pipelines moved 310,042,950 tons, water carriers 63,081,850 tons, trucks 22,923,695 tons, and railroads 2,828,541 tons.

Pipeline shipments reached 77.73 per cent of the total compared with 71.01 per cent in 1938, when the annual transportation reports were begun. Pipelines have enjoyed steady, if gradual, growth since then except for a 4-year slump in 1945-48. This decline in pipelines' share of total crude shipments resulted from abnormal growth during the early '40's when war supply lines and German submarines took dozens of tankers off the Gulf-East Coast run.

Water carriers last year declined on both a volume and percentage basis. Their volume was the lowest in 10 years. Their share of the total dropped from 25.58 per cent in 1938 to 15.81 per cent. One reason was the decline in dependence on barges which limits a refiner in his choice of plant location. Another major cause: Imports to the East Coast are cutting into the domestic crude market supplied by tanker from the Gulf Coast.

Trucks hauled 5.75 per cent of the total to register their tenth consecutive gain. Their 1938 share was only 1.17 per cent.

Railroads, which reached a peak during wartime 1943 with 24,890,590 tons, or 10.34 per cent of the total, had only 0.71 per cent in 1955.

Products transportation . . . Water carriers are still the leading transporters of products, but they no longer dominate the field as they did prior to World War II. And trucks have moved into a strong second position.

Total refined products carried in domestic transportation last year amounted to 561,551,206 tons. Of this water carriers moved 220,925,284 tons, trucks 199,680,665 tons, pipelines 102,110,296 tons, and railroads 38,834,961 tons.

The major shift in products transportation has seen trucks, which handled only 10.59 per cent of the traffic in 1938, take over virtually all the refinery-to-wholesaler movement formerly handled by railroads.

Although water carriers have still maintained their annual volume gains and reached a record high last year, their share of the total has dropped from a peak of 54.09 per cent in 1939 to 39.34 per cent, an all-time low. Trucks have more than tripled their share during the same period and now move 35.56 per cent of all products while railroads have slipped from 30.41 to 6.92 per cent.

Products pipelines, whose growth was speeded up by emergency wartime construction, have become increasingly important. Although restricted of course to the light oils only, pipelines in 1955 expanded their share of products shipments for the eighth straight year. Pipelines handled 18.18 per cent of the total last year, almost three times the 1938 figure.

California Firm on Block

LOS ANGELES.—Mt. Diablo Co. will take over substantially all of Mascot Oil Co.'s assets if stockholders of the two firms approve.

Mascot's holdings consist principally of 52 wells producing 400 bbl. of crude daily in Midway-Sunset field of Kern County, California. Mascot stockholders would receive one share of Mt. Diablo stock for every 1.6 shares of Mascot stock. Mascot stockholders vote on the offer October 29 and Mt. Diablo votes will be cast October 31.

Announcing

the Chromanette Series 9495 A Portable Instrument

POCKET EDITION of the Series 9400* *Podbielniak* CHROMACON

BASIC PRINCIPLE OF OPERATION: Based on partition elution (or adsorption elution), Vapor Phase Chromatography. Components are eluted with CO_2 (Janak method), and measured in a nitrometer, following removal of CO_2 in a caustic solution.

INDUSTRIES SERVED

Refineries
Steel plants
Natural gasoline plants
Gas Producing fields
Chemical and Petro-chemical plants
Gas utility companies for analysis of natural or manufactured gases.

APPLICATIONS: Applicable to the qualitative and quantitative analysis of almost any gaseous mixture as:

Nitrogen
Oxygen
Methane
Ethane
Propane
Ethylene
Propylene
N-Butane
Isobutane
Butene-1
Isobutylene
Cis Butene-2
Trans-Butene-2
Low-boiling Freons and others
Hydrogen
Helium
Carbon Monoxide
Acetylene
Argon
Neon
Xenon
Krypton

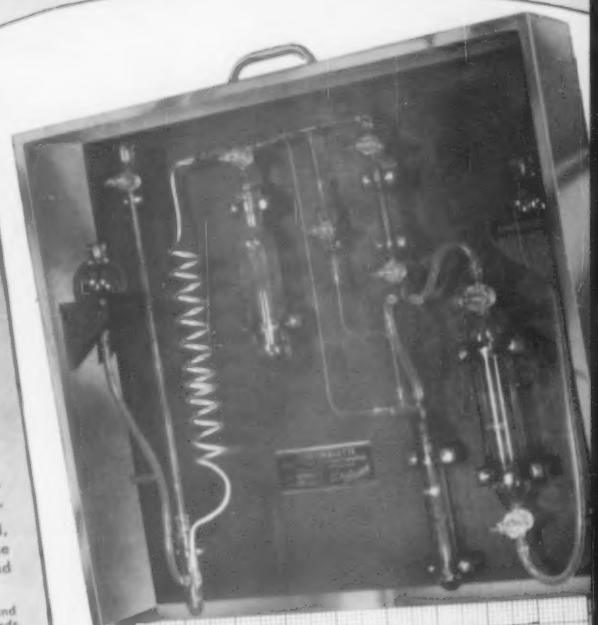
FEATURES: Portable and Inexpensive—No larger than a "one-suiter." Excellent for "on the spot" analyses, as a portable field test instrument for the analysis of natural or processed gases, or as an instrument in the laboratory. **Rapid Analysis** — Analysis completed in 5 to 20 minutes. **Accuracy**—Approximately 1%. **Simple Operation**—No calibration required, gives composition directly. Operation is simple, may be operated by anyone familiar with the Orsat method. A heated nitrometer may be used to extend the range to liquids boiling up to 75° C.

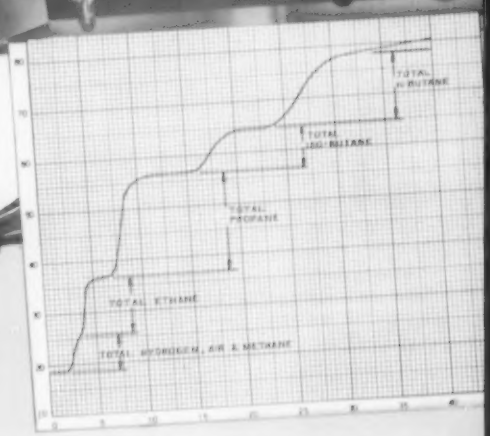
Limitations: Will not determine acid gases as: carbon dioxide, hydrogen sulfide, and any other gas which reacts with caustic solution. Cannot be used for compounds boiling above 40° C. due to condensation within the nitrometer.

Small Samples—1-5 ml. of gas required for complete qualitative and quantitative analysis.

WEIGHT: 15 lbs. **DIMENSIONS:** 24" high; 26" wide; 5½" deep.

PAGE 10,000





Chromanette Graphette Gas Analysis Curve

Copyright 1956 by Podbielniak, Inc.

*Write for CHM-956 & CH-F-856

2:30 *A. M.*

Dear Log Book: Graphette #1,635,432

Little did Botanist Tswett dream that his innocent Sherlock Holmes' device for analyzing leaves would 50 years later start a disturbing competition among scientists for the perfection of a device to "Analyze Almost Anything Accurately."

So consuming is this investigation, that in Podbielniak, Inc. alone, our researchers could not be more stimulated to activity than if we had discovered one of the current rare metals! They forget to go home for dinner... actually come down on Saturdays... and because we love those with whom we share our activities, we must get severe and threaten... "Enough for one day! Go home!"

In order to produce an accurate and scientifically, as well as aesthetically designed instrument, it is not sufficient to assemble a panel, a few knobs, and some tubelets. This is the reason the above laboratory report book is numbered: "10,000th Page." It has taken considerable investment to produce the 14 "Deluxe Volumes of Our Chromacon Apparatus, so completely illustrated in Brochure No. CH-F-856.

This Pocket-book Edition Chromanette Model Series, as indicated in Graphette No. 1,635,432, represents a Slice of the Series 9400 Deluxe Chromacon. Slightly less than 15 lbs... no larger than a portmanteau... this Chromanette Model should be Voted the Best Seller.

The Chromanette Series 9495, will be particularly useful in refineries, steel plants, natural gasoline plants, gas-producing fields, chemical and petrochemical plants and gas utility companies for analysis of natural or manufactured gases for "on the spot" analysis.

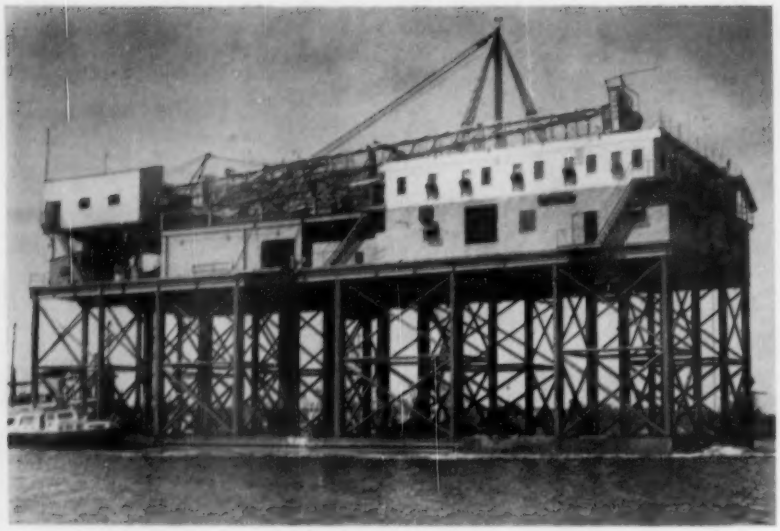
The Chromanecer Plant, which produces extremely pure products, should also warrant his interest. The Podbielniak Institute Training Course for reviewing all phases of vapor phase chromatography, both from a theoretical as well as from a practical standpoint, will complete the "know-how" required to use these fascinating new devices.

It's very late, and even my two Simian assistants are impatient! Joey is scolding as he wants to close this heavy book, while Jimmy, our little philosopher, patiently waits until we are ready to sign off.

So until the next experiment...

Excitedly yours,
(Mrs.) Walter J. Podbielniak
Executive Vice President

PODBIELNIAK, INC. 341 East Ohio Street Chicago 11, Illinois



"St. Louis" Ready for Work

NEW ORLEANS.—The third offshore drilling barge has been completed for Ocean Drilling & Exploration Co.

The new vessel, "St. Louis," was built by American Marine Corp. It is designed for operations in 30 ft. of water and for drilling to 18,000 ft.

A submersible-type barge, the "St. Louis" is similar in design to the "John Hayward" now operating for Ocean Drilling. The company also operates the "Mr. Charlie."

Costing about $1,750,000, the new barge measures 180 ft. by 120 ft. It has air-conditioned quarters for a 40-man crew.

A fourth barge is now being built for Ocean Drilling & Exploration Co. by Alabama Dry Dock & Shipbuilding Co., Mobile. It is designed for 65-ft. water and will cost about $3,500,000. Construction is expected to be completed late this year.

California Feudin' Gets Hotter

SACRAMENTO.—At its last meeting in Los Angeles, the three-man California State Lands Commission agreed to take a public stand on the merits, or lack of same, of the hotly contested oil and gas conservation measure.

The three-man opinion has now been released. It showed these results:

. . . **Robert C. Kirkwood,** state controller, firmly for the measure.

. . . **Harold J. Powers,** lieutenant governor, firmly against the measure.

. . . **John Pierce,** state director of finance, firmly neutral.

So the State Lands Commission joins the rest of the state in being firmly split down the middle on this controversial ballot measure which comes up for a vote November 6.

Stands attacked . . . Immediately after the opinions were made public, both Powers and Kirkwood became targets for verbal bouquets and brick-bats.

The big blast was leveled by the California Committee Opposed to Oil Monopoly. On Lt. Gov. Powers' endorsement, it had this to say:

"Lt. Gov. Powers' clear-cut statement opposing Proposition 4 reflects his honesty and courage in standing up for the people and his refusal to bend the knee to Standard Oil Co. and the other seven oil importers backing this measure."

Of Kirkwood's favorable opinion they said:

"Controller Kirkwood is guilty of a cynical betrayal of the public trust. He should be impeached. He has swallowed the propaganda line of Standard Oil, Richfield and six other importers financing Proposition 4 to the tune of $6 million."

Proponents of the conservation proposal so far have withheld fire.

Labor opposing . . . But they are busy defending themselves on another front in the fight. The International Association of Machinists filed a $5-million lawsuit against backers of the measure. Proponents were accused of illegally claiming I.A.M. support on campaign literature.

In addition to $5 million damages, the I.A.M., with a 200,000 membership on the West Coast, sought to enjoin backers of Proposition 4 from distributing pamphlets and other campaign material bearing I.A.M. endorsements.

Oklahoma Gas Signed Up

WASHINGTON.—Kansas-Nebraska Natural Gas Co. plans to sell gas from Camrick field, Texas County, Oklahoma, to Northern Natural Gas Co. of Omaha.

Northern Natural has signed a contract for 30,000,000 cu. ft. of gas daily for 3 years. Thereafter, the volume would be at least 10,000,000 cu. ft. daily. And Kansas-Nebraska could use the other 20,000,000 cu. ft. for its own needs.

Kansas - Nebraska asked Federal Power Commission approval of the gas sales and of plans to build 60 miles of line. The project would cost $3,000,000.

Salt Lake Tariff Cut

SALT LAKE CITY. — Increased throughput will enable Salt Lake Pipe Line Co. to cut tariffs on its Salt Lake City-Spokane products line, probably around December 1.

The company said the Salt Lake-Spokane tariff will be reduced 9 cents per barrel to 68 cents. The rate from Salt Lake to Boise will drop 10 cents to 32 cents a barrel.

Capacity of the line to Boise will be around 45,500 bbl. per day and from Boise to Spokane, 24,500 bbl. per day.

Investigate the profitable way of doing business afforded you by private executive aircraft ownership — ask about Beechcraft's attractive leasing or financing plans.

THE BEECHCRAFT BONANZA

Does Most for You!

Here's why *thousands* of Beechcraft Bonanza owner-users say the Bonanza does *more* for them than any other single-engine business airplane — and will do *most* for you:

★ **FASTEST** — the Beechcraft Bonanza cruises at 190 miles-per-hour at 75 per cent of power.

★ **QUIETEST** — the sound level inside the cabin of the Beechcraft Bonanza is the same as inside a modern automobile traveling 60 miles-per-hour. No other airplane flies as quietly.

★ **MOST VISIBILITY** — through windows larger than those in *any* other commercial airplane, passengers and pilot have unexcelled visibility and maximum flight enjoyment.

★ **GOES FARTHEST** — with wing fuel tank cells, the Beechcraft Bonanza flies 1170 miles non-stop.

★ **MOST USEFUL** — the Beechcraft Bonanza carries more passenger and baggage weight than any other single-engine business airplane.

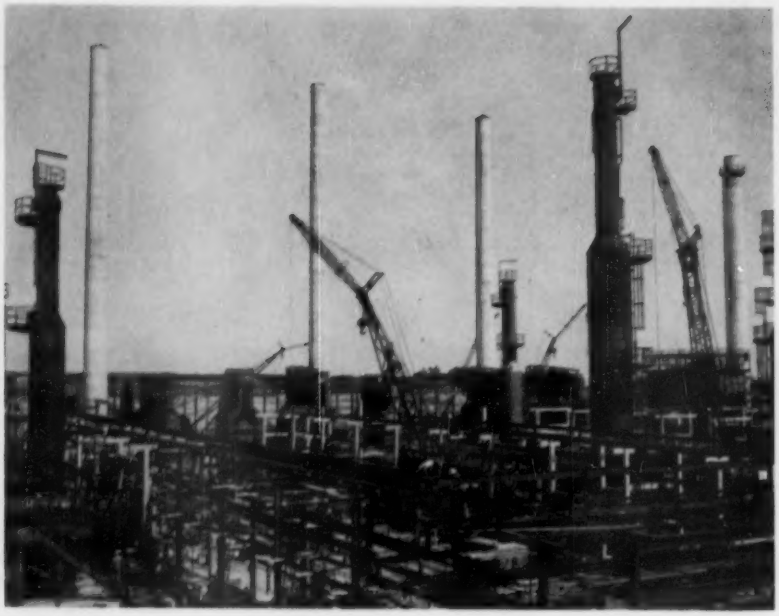
★ **STRONGEST** — no other single-engine business airplane can match the Beechcraft Bonanza's ruggedness.

★ **MOST EFFICIENT** — takes no more fuel to operate than the family automobile. You can operate the Beechcraft Bonanza — *and pay for it* — for as little as 2½ cents per seat mile!

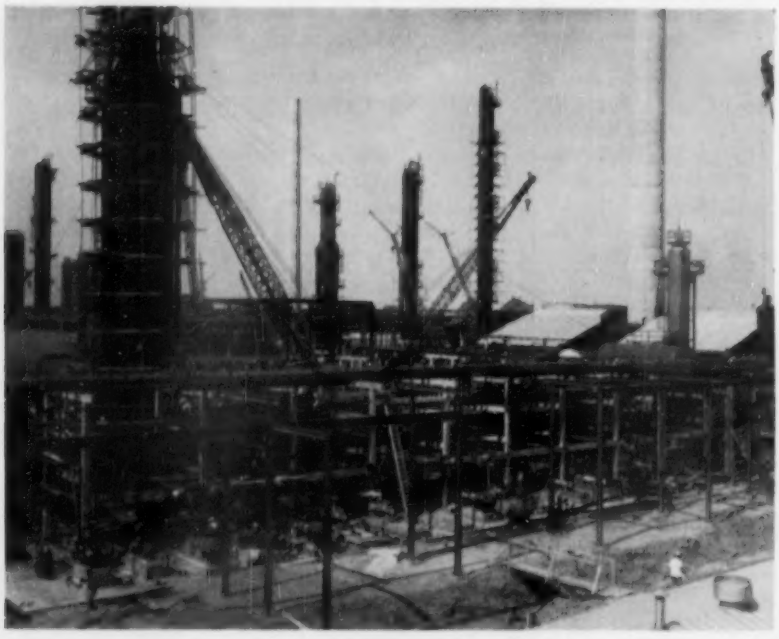
See your Beechcraft distributor or dealer, or write Beech Aircraft Corporation, Wichita 1, Kansas.

Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS



World Records Tumbling as . . .



. . . Tidewater Sends Up Giants

DELAWARE CITY. — The world's largest hydrogen-treating installation, top photo, and catalytic reformer, bottom, are taking shape at Tidewater Oil Co.'s 130,000-bbl. refinery nearing completion here.

Tidewater has not revealed the type of process being used or the total capacity of the hydrogen treating installation. The construction photo shows seven heater units, indicating that hydrogen treating is being undertaken in several units treating intermediate streams.

The hydrotreating group will utilize the byproduct hydrogen from the catalytic reformer. It has been unofficially reported that additional hydrogen will be required and that a hydrogen production unit is incorporated in the overall plant scheme.

First Iso-Plus . . . The catalytic reformer will have a capacity of 45,000 bbl. daily. It will also be the first in the United States and the second in the world to use the Iso-Plus process.

The world's first was placed in operation last July by S.A.R.O.M. at Ravenna, Italy. Iso-Plus combines the basic Houdriforming process with extraction and thermal reforming of low-octane reformate fractions. It is licensed by Houdry Process Corp.

The other processing units going up at Tidewater's Flying A refinery will also rank as the largest of their type ever built. They are crude distillation, catalytic cracking, and fluid coking.

Sinclair Gets Nod

Southern Production deal will be closed next month

FORT WORTH.—Southern Production Co., Inc., expects to complete liquidation proceedings by November 1. Stockholders of the firm this month approved sale of oil and gas assets to Sinclair Oil Corp. for $107½ million.

The deal is subject to Southern Production's disposal of its 67.55 per cent interest in Offshore Co., and sale of production payments it will receive from Sinclair. Sale of the drilling firm is pending with Southern Natural Gas Co.

Southern Production proposes to pay its stockholders a first-liquidating distribution of "not less than" $33 in cash and 1/5 of a share of Southern Natural stock for each share of Southern Production. Payments will be made November 16.

Sinclair will pay $42½ million cash and production payments from Southern Production properties totaling $65 million over a 10-year period. The sale will give Sinclair additional crude reserves estimated at 18,462,760 bbl. and gas reserves estimated at 525,000,000 M.c.f. *(The Oil and Gas Journal, July 30, page 121).*

Sinclair will also pick up 40 per cent interest in the $25 million Great Northern Oil Co. refinery at Pine Bend, Minn.; 40 per cent interest in Minnesota Pipe Line Co.; 20 per cent interest in South Saskatchewan Pipe Line Co.; and 8½ per cent interest in Westpur Pipe Line Co.

JOHN WIGGINS' ANSWERS TO 8 QUESTIONS CAN HELP YOU SELECT A BETTER FLOATING ROOF SEAL

Are all floating roof seals the same? What about safety? Conservation? We asked John Wiggins, inventor of the floating roof and noted conservation authority, to answer questions most commonly asked about the new Wiggins Safety Seal.

1—**Q.** In the new Wiggins Safety Seal does any of the mechanism contact the liquid?

A. No. All metal working parts are out of the liquid away from corrosive vapors.

2—**Q.** Does the new "Weather Hood" provide longer fabric life?

A. Yes—the fabric is protected from the sun and other elements—lower temperature under the hood provides added conservation.

3—**Q.** In old style seals, rust and scale accumulate and shorten seal life. Does this happen with this seal?

A. The "Weather Hood" prevents rust and scale from depositing in the "seal loop"—thereby increasing seal life.

4—**Q.** Does the Wiggins Safety Seal prevent rim fires?

A. Yes—design of the seal virtually eliminates critical vapor spaces where air and vapor collect to form explosive mixtures. When exploded through controlled tests, the fabric was able to expand enough to contain the explosion without tearing.

5—**Q.** Is this seal safe for the storage of low vapor-pressure, low flash-point liquids such as jet fuels?

A. Yes, the design of the Wiggins Safety Seal reduces the danger area to a minimum so that it can be used in the storage of jet fuels with complete confidence.

6—**Q.** How does the Wiggins Safety Seal guarantee maximum protection against evaporation loss?

A. Air-vapor volume of the Safety Seal is less than 10% of the present volume for floating roof seals. This would eliminate most losses. In addition, the air-vapor space is shielded by a "Weather Hood". This area—the area that breathes—reduces losses to a minimum.

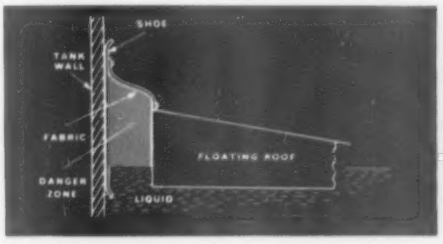
7—**Q.** Will the Wiggins Safety Seal save me money?

A. Yes—by eliminating losses due to thermal breathing, preventing rim fires, use of new longer-lived fabric, protecting the mechanism from liquid and corrosive vapors and permitting much longer periods of "in-service" operation.

8—**Q.** Why have you put so much emphasis on the seal?

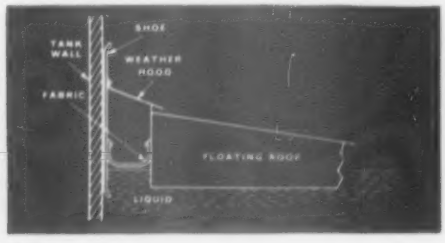
A. A floating roof is only as safe as its seal. With the new Wiggins Safety Seal, Wiggins floating roofs are in a class by themselves. Since General American makes all types of floating roofs, you can have the Wiggins Safety Seal on the roof that best meets your needs—whether it be the Wiggins Hidek*-Lodek* or Doubledek*.

*Patented



OLD

With the old type seal, the fabric is exposed to the sun's rays and explosive vapor collects in the large space between the liquid and the fabric; the mechanism is submerged in the liquid and exposed to corrosive vapors.



NEW

With the new Wiggins Safety Seal, vapor space under the circumferential fabric is reduced to a minimum. Ends spark fire hazards. Fabric is protected from the sun. Mechanism is out of liquid and corrosive vapor space.

To see why Wiggins Floating Roofs pay for themselves, write or call your General American sales engineer.

PLATE AND WELDING DIVISION

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street, Chicago 90, Illinois

Lake Block Farmed Out

● Atlantic Refining, Sun strengthen Venezuelan position with farmout from independent group on semiproved tract

ATLANTIC REFINING CO. and Sun Oil Co. will expand their operations in Lake Maracaibo under a farmout obtained from Venezuelan American Independent Oil Producers Association, Inc.

The two companies will develop Lot V-574, a semiproved block of 841.72 hectares (2,078 acres), for which Venezuelan American paid $1,846,264 when national reserves were offered by the Venezuelan Government last July.

Details of the contract have not been revealed. But Atlantic, through Venezuelan Atlantic Refining Co., and Sun will be joint owners. Venezuelan American, a group of U. S. and Latin American independents, will retain title to the lot.

The acreage lies on the east side of Lake Maracaibo. It is surrounded by prolific producing concessions of Mene Grande Oil Co. (Gulf), which returned the block to the government in converting from exploration to exploitation operations. The government gets half of such acreage for reoffering.

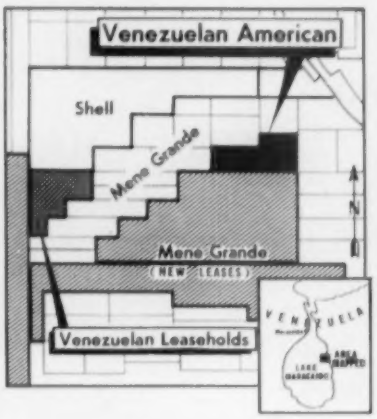
Sun and Atlantic pooled their resources last summer to make the top bid of $17,100,000 on another Lake Maracaibo tract, this one comprising 24,710 acres. They paid $450,000 for an equal area in Apure. Atlantic already held 722,595 acres under concession in Venezuela and produces more than 20,000 bbl. daily. Sun, formerly a strictly domestic company, is a newcomer to the country.

Another deal coming? . . . This farmout may be the tipoff that Venezuelan American has another deal in the works.

It has another block of 9,999.6 hectares (about 24,700 acres) in Lake Maracaibo and 98,840 acres in Zulia State. The 24,700-acre lake tract is a hot development prospect for which Venezuelan American paid more than $17 million. It would be logical to seek financial help to underwrite the huge bonus or drilling costs, or both, from a major company or independent.

There are several prospects among companies which were outbid in the leasing when offers ranged above $2,500 per acre in some cases and royalty was as high as 25 per cent.

The Venezuelan American deal with



Sun-Atlantic does not follow the pattern of Venezuelan Leaseholds, C.A., another newcomer to Venezuela which made a successful lake bid. Leaseholds arranged for outright sale of its 796-hectare national-reserve tract to Tennessee Gas Transmission Co., San Jacinto Petroleum Corp., Union Oil & Gas Co. of Louisiana, Murphy Corp., and Lion Oil Co., a division of Monsanto Chemical Co. *(The Oil and Gas Journal, October 1, page 70).*

Leaseholds would be reimbursed for its $3,600,000 bonus paid and still get half the profits on the lake operation once all expenses are recovered.

Turkish Plant Runs Smoothly

The new refinery in southeastern Turkey operated at 88 per cent capacity the first half of the year.

The small plant at Batman is probably the most modern to be set up as part of an integrated operation in an isolated area. Crude supplies come from nearby Ramandag and Garzan fields. Products are consumed locally.

Products output averaged 5,730 bbl. daily the first 6 months, compared with its rated output capacity of 6,470 bbl. daily. Input capacity is rated at 6,950 bbl. daily.

Yields the first half were: Fuel oil, 3,570 bbl. daily; gasoline, 1,250 bbl. daily; asphalt, 640 bbl. daily; and diesel oil, 270 bbl. daily. The plant was designed to yield 500 bbl. daily of jet fuel; 1,430 bbl. daily of gasoline; 3,120 bbl. daily of fuel oil; and 1,420 bbl. daily of asphalt.

The distillation unit in the $14,000,000 plant went on stream in August 1955. The catalytic cracker began operation in December.

Russian Scramble

Soviets release satellite production figures—maybe

RUSSIA claims the "People's Democracies" (Soviet satellite nations plus Yugoslavia) accounted for about 58 per cent of total European oil production outside the USSR in 1955.

At the same time, it gave output statistics for Albania, Poland, and Czechoslovakia that are considerably below previous estimates made by Western sources.

The publication Neftianoye Khoziaistvo, official organ of the USSR's Ministry of the Oil Industry, lists 1955 petroleum production (1954 figures in parentheses where cited) in barrels daily as follows: Rumania, 211,500; Hungary, 30,000; Yugoslavia, 5,200 (4,300); Albania, 4,400 (4,400); Poland, 4,000; and Czechoslovakia, 2,800 (2,200).

Significantly, no production figures are given for Bulgaria, thereby continuing the virtual blackout of petroleum information from that country. Neftianoye Khoziaistvo said, however, that there has been considerable oil activity in Bulgaria's Dobrudja region in recent years.

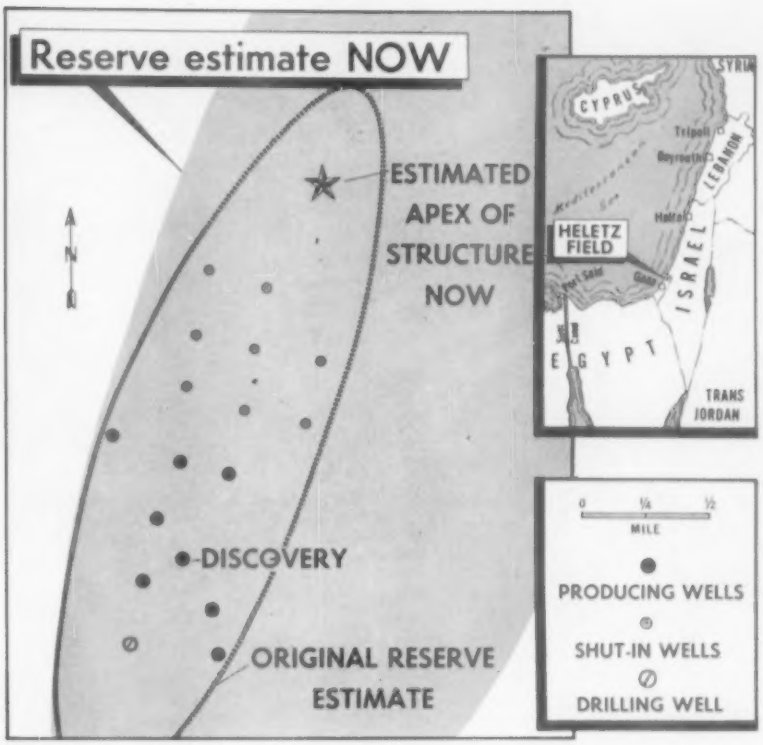
The Russian publication contributed more confusion to Chinese oil output statistics. It used two figures—13,300 bbl. daily and 19,300 bbl. daily—for 1955. Previous Communist reports had placed Chinese 1955 daily oil production as high as 36,000 bbl.

Petrofina to Build Refinery

The West German subsidiary of Cie. Financiere Belge des Petroles S. A. (Petrofina) will build a new 20,000-bbl. refinery.

Location of the plant is not yet definite. But it will be separate from Ruhrbau's 6,500-bbl. plant, near Cologne, and is expected to go into operation in about 2 years. It will be designed for high yields of heavy and medium distillates.

Petrofina entered the West German refining and marketing picture last year when it acquired 75 per cent interest in Ruhrbau from Bayer interests. The refinery was closed down at the time. Operations were resumed this spring.



Heletz Looking Up

Size of Israeli field dwarfs original estimates; proved reserves have increased by six times in past few months

DEVELOPMENT drilling at Heletz field in Israel has progressed to the point where its operators can tell pretty much what is shaping up. And they like what they see.

The small, closely studied field is far from delineated. But stepouts indicate a structure several times larger than originally estimated. Proved reserves were calculated a few months ago at 10,000,000 bbl. on the basis of the first three wells. The figure has been raised to 50,000,000 to 60,000,000 bbl.

Here's how the picture looks:

. . . **The apex of Negba** maximum along Heletz anticline probably lies about 2 miles north of the discovery, Heletz 1. The well was first thought to be at the peak. This means the producing structure is probably 4 or 5 times bigger than anticipated.

. . . **No indications of edgewater** were found in nine wells completed. The only limiting factor so far was that producing sands have low porosity and clay toward the west side of the field.

For these reasons, most new well locations are being staked to the east and north of the discovery. The best sands to date, however, were found in No. 6, the most southerly well drilled.

The joint operators, Israel Oil Prospectors Co., Ltd., and Lapidoth Israel Petroleum Co., Ltd., brought in the discovery, the first in the country, last year by deepening a hole abandoned by Iraq Petroleum Co., Ltd., when Arab-Israeli hostilities broke out.

Output is now 700 bbl. daily from five flowing wells. Four more are shut in, awaiting tubing. There will be a total of 33 wells completed by the end of 1957 and 66 by the end of 1958.

Dr. Walter R. Fehr, chief geologist for I.O.P., said that when the apex of the structure is definitely established, a deep test to basement will be drilled from that point. Current production comes from Lower Cretaceous.

Except for the first three wells, drilled on a 40-acre pattern, wells are laid out on 80-acre spacing. Producing wells are on a ⅝-in. choke.

The operators also plan to wildcat on Beeri maximum along the same anticline to the south. One dry hole drilled in the area was off structure.

Prospects bright . . . Dr. Fehr, former chief geologist in Egypt for Royal Dutch-Shell, commenting on the general outlook says he is fairly confident Israel's crude production would meet domestic needs sometime within 10 years. Current consumption is about 24,000 bbl. daily.

He says with a chuckle that the biggest geological disadvantage of Israel is that it does not extend another 40 km. into the Mediterranean. He believes the best chances for finding major fields lie at sea. He adds that offsore work is unlikely in the near future, mainly because of costs, unless the work is an extension of onshore production.

Besides their exploration work in the Heletz area, about 30 miles south of Tel Aviv, Lapidoth and I.O.P. also are doing extensive work in the Dead Sea region.

More Pakistan Gas

East Pakistan well shut in because of high pressures

PAKISTAN PETROLEUM, LTD., suspended drilling on 2 Sylhet in East Pakistan after encountering high-pressure gas at 9,245 ft.

The company said that pressure made further work temporarily inadvisable. The well was shut in October 9 by blowout preventers.

Gas shows were first met at 4,000 ft. But the test was deepened in search of oil. Last year, 1 Sylhet cratered after hitting high-pressure gas. The rig and camp were destroyed in the subsequent fire. P.P.L. has called the discovery a major field.

Shows in India . . . Another Burmah Oil Co., Ltd., subsidiary has found oil shows in a wildcat 25 miles west of Nahorkatiya field in Upper Assam, India.

Assam Oil Co., Ltd., encountered the show in 1 Moran, which was bottomed at 13,739 ft. The company said it was too early to evaluate the results and tests are under way. A second well is planned.

China Aims at Bigger Output

China has called for a sharp increase in crude-oil production under its Second Five-Year Plan (1958-1962).

The Eighth Chinese Communist Party Congress meeting in Peking set an oil output goal of "5 to 6 million metric tons" for 1962. It also disclosed that present plans call for production of 2,012,000 metric tons in 1957 as compared with actual output of 436,000 metric tons in 1952 and 320,000 metric tons in 1943, "the best previous year."

SWEEPING A ROADWAY free of mines is the first step in hunting for oil in the Libyan desert. The land mines planted by both Allied and German armies in World War II make free passage over the desert impossible. Mine clearer above is using a British Army-type detector. At left Libyan native is marking the cleared path by digging with a hoe. Supervisor in back will go into action and disarm mines found.

BEST DESERT ROUTE to be cleared of mines next is being discussed by mine-clearing crew in Libya. These experts are employed by Swiss-American firm at Bengazi which specializes in mine clearing.

END OF MINE is marked by smoke on the Libyan desert. After the mine's detonating mechanism is removed, the charge is burned.

Land Mines Plague Libyan Oil Hunt

SEARING heat, lack of water, and all the general discomforts of the desert are usually enough to keep an oil exploration project from being a picnic. But a few thousand souvenirs of World War II's desert fighting are an added nuisance in Libya.

Land mines can scarcely be regarded as just another natural hazard of the job by a geophysical crew intent on locating a promising structure.

A dozen oil companies have been granted rights over almost 127 million acres of Libyan territory. Much of it lies in the regions that were traded back and forth — reluctantly—by the Italians, Rommel's desert legions, and the British Eighth Army in the see-saw battling for North Africa.

The oil companies are learning today that the opposing armies were not at all tidy about cleaning up the mine fields they planted for each other. It has been 15 years since most of them were laid, but those mine fields are just as lethal today as they ever were.

D'Arcy Exploration Co. (Africa), Ltd. (British Petroleum Co., Ltd.) is one of the several companies having mine troubles. D'Arcy, with four concessions totaling 8,977,143 acres, is already at work taking care of the mines in its areas.

D'Arcy turned the problem over to a Swiss-American firm at Bengasi which specializes in mine clearance. The company, Gaynor, Rieter & Co., is now at work on the laborious job of making D'Arcy's concessions safe to work.

How it's done . . . The company doing D'Arcy's work is probably as experienced at its job as any in the world. Before taking on the D'Arcy contract, it had lifted, neutralized, and salvaged the explosives from 100,000 mines.

The work is done by a 19-man party operating entirely independently of any other unit. The group maintains its own mobile camp in the desert, complete with all equipment from motorized units down to a dozen of the latest British army type mine detectors.

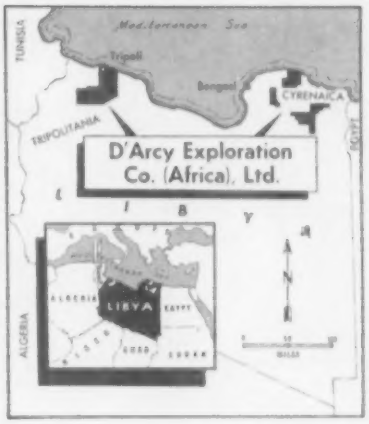
The working party is under the direction of a coordinator. He has two Italian supervisors and four Italian mine clearers. Each clearer has a Libyan "track-marker" and two "path fixers."

Because of the extent of the area,

only roadways are being cleared of mines at first. The first step involved in sweeping a 16-ft. roadway is taken by a supervisor. He takes a magnetic bearing on a point about 400 yards away and then a mine clearer moves out with his detector sweeping the ground ahead of him. As the clearer walks, he plays out a line to mark the center of the path he is sweeping.

Using this line as a base point, two more mine clearers sweep an area 8 ft. on each side of the line. Behind each clearer walks the "marker" who carefully marks the extent of the mine detector's sweep with a pickaxe. He is followed by the two path fixers. One marks the limits of the swept area with stones and his partner daubs the stones with a white plaster wash so they can be seen easily.

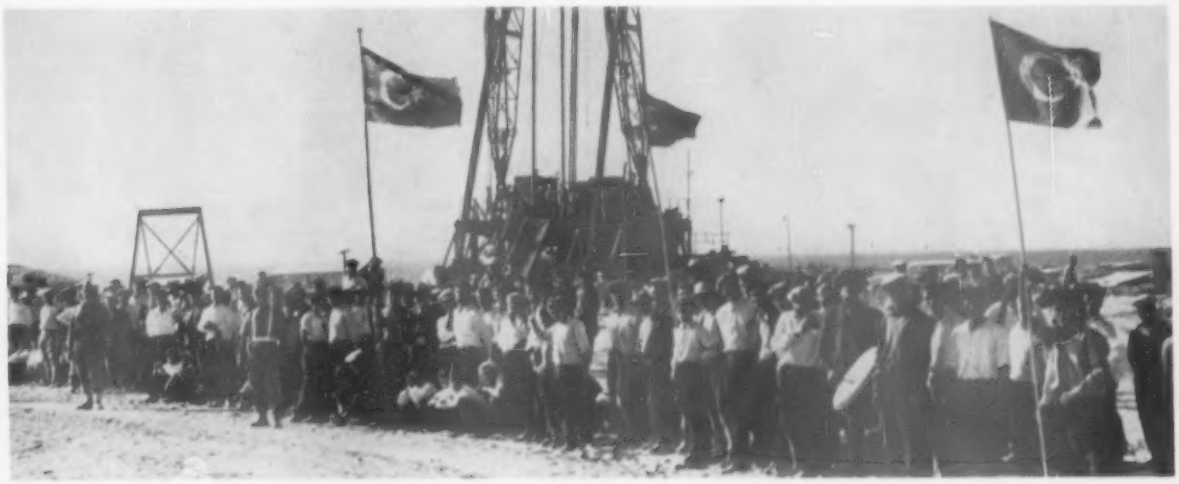
This group can clear mines from a roadway 16 ft. wide at the rate of approximately 6 km. or 3.6 miles a day.



How mines are handled . . . The minute a clearer finds a mine with his detector, the entire party halts. While the rest withdraw a safe distance, the clearer moves the sand away and exposes the mine.

If he is familiar with the type of mine, he neutralizes and disarms it. If he can't handle the mine himself he calls on the supervisor. If the supervisor doesn't recognize the type or if it is one of many types of antipersonnel mines still found in Libya, a former Royal Engineer officer on D'Arcy's company staff takes over.

D'Arcy plans to crisscross the mine-laden areas of its concessions with enough of the 16-ft. roadways at right angles to each other to allow geophysical crews to move around fairly easily. Once the geophysical work has been completed, the company thinks then it will be better able to tell where the more detailed clearing work will have to be done to make an area safe for drilling crews to move in.



Spudding A Well In Turkey Is Quite A Picnic

TURKISH officials made quite a party of spudding in ceremonies at the first well drilled under the country's new oil law. Prime Minister Adnan Menderes turned out with a band to give Gilliland Oil Co. 1 Eskenderun a big send off.

The well is being slant-drilled from shore to test an anticline that extends into the Mediterranean Sea.

The local populace assembled with the prime minister for spudding in (top photo) near the sea. Premier Menderes released the brake to start drilling on the well (right photo). At his left was Joseph Gilliland, president of Gilliland Oil Co., Los Angeles, and Tommy Thompson, Drilling & Exploration Co. engineer who is supervisor on the well.

Last week the well was below 2,000 ft. It is projected to 3,500 to 4,000 ft.

Big Deal for Little Port

Esso will build 100,000-bbl. refinery at Welsh fishing village; British grooming site for supertanker harbor

ESSO PETROLEUM CO., LTD., plans to build a 100,000-bbl. refinery at Milford Haven, a Welsh fishing port capable of handling 45,000 to 100,000-ton tankers.

Sir Leonard Sinclair, chairman of the Standard Oil Co. (N.J.) subsidiary, said the projected refinery would cost about $56,000,000. This would include berthing facilities to handle tankers of the largest foreseeable tonnage.

The company already owns 800 acres west of Milford Haven. Preliminary planning would take a year.

Sinclair emphasized that the Suez Canal crisis had nothing to do with the project. He indicated the plans were a part of a long-range expansion program to meet growing demand in the United Kingdom.

Building at Fawley . . . Esso Petroleum's Fawley refinery, already the largest in the U.K., also is being expanded. An additional 50,000 bbl. daily will bring total capacity to 200,000 bbl. daily by the end of 1958.

The selection of Milford Haven reflected the growing importance of giant tankers in the oil transportation picture. Vessels of 60,000 tons or more could economically carry crude to U.K. around the cape. They also would serve as a safe-guard from possible political or physical tie-ups at the Suez waterway.

None of the six tankers over 45,000 tons, in operation, nor the 29 on order, could directly discharge crude anywhere in Europe at present. Milford Haven could probably be developed to handle the big vessels more easily than elsewhere in Europe or the U.K.

B.P. in act, too . . . Esso's announcement to build a refinery where it could unload giant tankers followed on the heels of a British Petroleum Co., Ltd., decision to include 60,000 tonners in its next round of ship-building.

B.P. has planned a crude terminal directly across from the Esso site, where it also could take advantage of the deep-water natural harbor. B.P.'s two-berth terminal would supply crude through a 60-mile pipeline to the Llandarcy refinery.

Milford Docks Co., which operates present facilities, has put forward its own project to make the port the most important supertanker terminal and dock center in Europe. The scheme would cost from $36,000,000 to $42,000,000 and would require both government and oil-company participation *(The Oil and Gas Journal, September 24, page 102)*.

Guatemala Award

Conoco Gets Peten region acreage for unit operation

GUATEMALA has awarded a 394,000-acre exploration concession to Continental Oil Co. of Guatemala, a subsidiary of Continental Oil Co.

The acreage will be combined with concessions granted subsidiaries of Ohio Oil Co. and Amerada Petroleum Corp. for unit operation. One of the three companies will be named operator.

Preliminary exploration has been conducted on the Conoco acreage. Company officials said additional operations will start immediately.

The Continental acreage is in northern Guatemala, in the Flores area of Peten. It was announced earlier that Amerada would get a 218,852-acre concession in Central Peten *(The Oil and Gas Journal, October 8, page 129)*.

Continental was among 29 organizations filing applications for petroleum rights in Guatemala in November 1955, following passage of the nation's present oil law. The Continental subsidiary was one of 22 companies declared eligible for concessions last spring.

L. F. McCollum, president of the parent company, said the new concession had been approved by the Guatemala government's Ministry of Economy. Formal title is expected to be issued within a few weeks.

Industry BRIEFS

Swan-Finch Oil Corp. is planning a new program to develop crude-oil production. Swan-Finch is an independent company founded in 1953. It has long been a manufacturer of lube oils and greases, but last year began to diversify and now is active in gas production, uranium mining, and other fields. Ralph E. Damp has resigned as a Standard Oil Co. (N. J.) executive to become president of Swan-Finch.

Kewanee Oil Co. has purchased the 735-acre Amour Loriaux water-flood project in Washington County, Oklahoma, for a price reportedly exceeding $400,000. Production is estimated at 250 bbl. daily from 32 wells producing from the Bartlesville sand around 1,270 ft. The tract also includes 18 input wells.

Union Oil Co. laid the cornerstone for its new $20,000,000 headquarters in Los Angeles last week during the company's sixty-sixth anniversary celebration. A metal plaque bearing a message from former President Herbert Hoover was unveiled. A book containing the signatures of Union's 9,000 employes was placed in the cornerstone.

Lowlands Exploration Co., subsidiary of Imperial Oil, Ltd., plans to drill a second wildcat on the south shore of the St. Lawrence River across from the city of Three Rivers (Trois Rivieres) Quebec.

The company's first venture, begun near the community of Leclercville, is to be abandoned. This test, a dry hole, was carried to a depth of 3,300 ft. The new wildcat will be known as Imperial-Lowlands No. 2.

H. C. Price Co. expects to complete 55 miles of 22-in. this week on a leg of the American Louisiana pipeline between Defiance, Ohio, and Bridgeman, Mich. The Price spread will meet crews of Houston Contracting Co. which worked northwest from Defiance. Target date for the tie-in is Wednesday.

The S. S. Marine Dow-Chem, first American vessel to have its hull equipped with magnesium anodes to prevent electrolytic corrosion, has withstood 2 years in the water without a coat of bottom paint. Marine Transport Lines, Inc., which leases the liquid chemicals carrier to Dow Chemical Co., says it plans no more painting below the water line. The company says corrosion in internal ballast tanks has been halted by installation of the anodes.

It takes a complete team to keep dependable drilling mud service available for you

Meet this Magcobar Man, whose construction work assures you of a steady supply of drilling fluids

More and deeper drilling and the resulting increase in the use of drilling muds has focused attention on the mining and production of drilling fluid additives. Magcobar, possessor of the industry's largest producing facilities, has accepted this challenge by accelerating its plant construction and expansion program at an ever-increasing pace.

As a result, from Nova Scotia to Mexico, from Greece to Nevada, Magcobar construction supervisors, like this one, are working at plant expansions to assure a continued supply of high quality drilling fluids for the oil industry. These construction specialists are important members of the Magcobar team that provides the most complete drilling mud service in the oil fields.

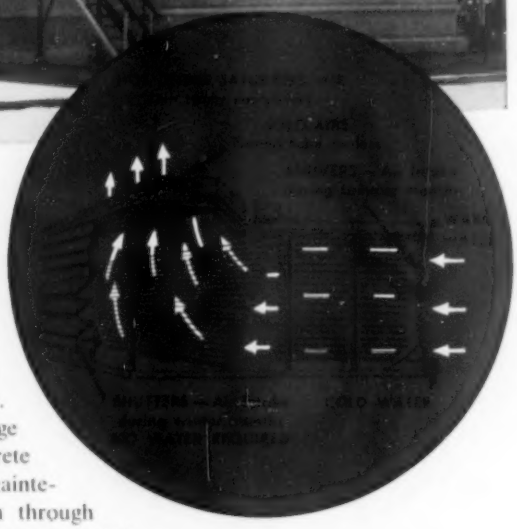
Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION

Houston, Texas

HUDSON Combin-aire

LOW TEMPERATURE COOLING USING COMBINATION OF MINIMUM WATER AND MAXIMUM AIR



Where quantity or quality of water is low, and ambient air temperatures too high to permit direct cooling with air, process plant designers find the modern solution in Combin-aire. In addition to large savings through minimizing water consumption and eliminating water treatment, Combin-aires incorporate many other advantages.

The Combin-aire pictured above, installed in a large gas processing plant in northern Mexico, is of concrete construction, eliminating fire hazard and minimizing maintenance. As shown in the cut-away drawing, air is drawn through cooled water by fans located on top of the structure. The air, precooled and washed free of solids by the water, flows across the finned tube coolers, and leaves the top of the Combin-aire at elevated temperature under-saturated with water vapor. Mist carryover, condensation from effluent air, and air recirculation are thus eliminated. Combin-aires are installed adjacent to process equipment, minimizing piping and concentrating operating area.

In winter, air flows directly to the Solo-aire finned coolers, water circulation being unnecessary. Where water is required for shell and tube units or atmospheric sections, such water may also be cooled in the Combin-aire unit, eliminating the conventional cooling tower.

In addition to Combin-aire units, Hudson manufactures water cooling towers, air-cooled and water-cooled coolers and condensers, and is experienced in plant layout, piping, and water treatment. We shall be glad to assist prospective plant owners in making overall comparisons of first costs and operating costs for complete cooling systems using various combinations of equipment.

HUDSON

ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

405 Lexington Ave., New York 17, N.Y. • 2500 W. Sixth St., Los Angeles 57, Calif. • Corrientes 1115, Buenos Aires, Argentina

Gas-fired turbine-driven . . .

Centrifugal Compressors Find Their Place

by A. L. Vaughan

A fundamental characteristic of gas-fired turbines is their ability to develop more horsepower at low ambient temperatures. Experience shows that gas turbines could be considered for any application.

NORTHERN NATURAL GAS CO. has operated two gas-turbine stations through three winter heating seasons. Each of these stations consists of four 5,700-hp. gas-fired turbine-driven centrifugal compressors arranged in series:

1. During these three seasons the turbines have proved themselves to be as reliable as reciprocating-compressor stations.

2. The projected operating and maintenance costs are difficult to predict since there has been a variable demand for the turbine facilities. However, the operating and maintenance expenses for the turbine stations were approximately $5 per brake horsepower less fuel, per year as compared to approximately $13.50 for other reciprocating stations which operate on a comparable load factor. The major part of this savings is in operating labor.

3. From a cost-of-operation standpoint, it is apparent there is much to be gained by installing facilities with large-horsepower units and to provide sufficient controls and safety devices so that operating labor costs may be held as low as possible. Each installation must be weighed individually to obtain a balance between the cost of operating labor and the need for continuity of service and protection of equipment. We feel that we have satisfied our requirements for this continuity and protection and have still shown a very favorable saving in operating costs.

4. Our gas-turbine experience has left us convinced that the decision to use gas turbines in this particular application was a good one. Our experience to date is such that gas turbines would be considered in any application in which they could be used. However, recent advances in automatic controls and operation of reciprocating engines have made them very strong contenders in most gas-transmission applications.

Author is superintendent, compressor stations and processing plants, Northern Natural Gas Co. at Omaha, Neb. Paper presented at A.S.M.E. petroleum mechanical engineering conference, Dallas.

Centrifugal Compressors

Centrifugals were preferred to reciprocating compressors for operations at very low ratios. The pressure drop across the suction and discharge valves of a reciprocating compressor is relatively unimportant at higher ratios; however, at low ratios these losses become significant in compressor efficiency. Inlet and outlet losses of a centrifugal compressor are negligible.

There is, therefore, a saving in brake horsepower required to compress 1,000,000 cu. ft. of gas. The large throughput volumes also were factors in favor of centrifugals as the required horsepower could be utilized in a small number of large-horsepower machines—in our case, three compressors.

Relation of Ambient Temperature to Turbine Horsepower

A fundamental characteristic of gas-fired turbines is their ability to develop more horsepower at low ambient temperatures. This increase in horsepower conforms very well to our load requirements during winter months as is illustrated in Fig. 1. Our heating demand is such that the system is placed under heavy load only during those months when low ambient temperatures make extra horsepower available.

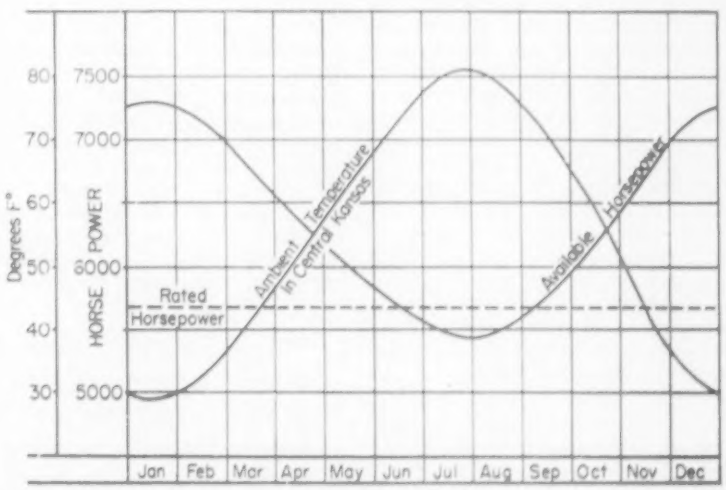
Personnel Requirements

The turbine stations proposed were to be designed for completely automatic operation. Although there has been much discussion relative to completely unattended stations, it was the company's decision that continuity of service is of paramount importance, therefore any consideration of unattended stations was abandoned. However, economic operation of these plants necessitated the use of as small a staff as possible.

It is our opinion that a staff of three operating personnel per tour would meet these service requirements. This staffing is still considerably below what could at that time be anticipated for a reciprocating station. Operating labor is a fixed cost whether the plant is or is not in operation.

Initial Plant Investment

As our company had no past experience with equipment of this nature, it was necessary to make cost studies in much more detail than was our normal



AVAILABLE turbine horsepower by season. Fig. 1.

practice for preliminary estimates. Completion of these estimates placed the gas turbines in approximately the same relative cost position as the reciprocating plants, which position was later verified by actual cost figures. The three-unit turbine stations were built for $270 per rated brake horsepower while a reciprocating station of similar size was built for $274 per rated brake horsepower.

Operational Experience

Since our first gas turbine was placed in operation in December 1953, there has been accumulated in excess of 52,000 operating hours as of March 1, 1956. These hours include two additional turbines installed in the 1954 expansion program. One of these units was installed at each station, making a total of eight turbines and 45,600 installed horsepower.

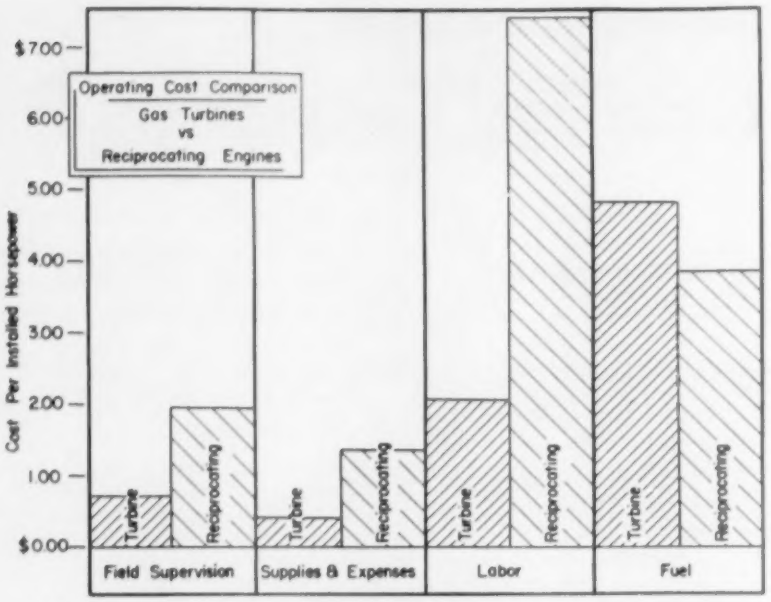
Time record . . . During the first 27 months, the equipment was available for operation in excess of 90 per cent of the time. Considering that these units were not required for lower load-factor operations, the turbine plants here are compared on a basis of availability rather than on a basis of hours operated.

For comparison, similar data have been compiled and summarized in Table 1 for a vertical and a horizontal reciprocating station which also has operated on a similar basis. Although the reciprocating station has a better availability record, it should be noted that the time considered for the turbine includes original station startup and the early months of operation when the so-called bugs had to be worked out of the equipment.

Reliability . . . Today, we are confident that the over-all reliability of a turbine station will be comparable with our reciprocating stations. We have one station in which all four turbines have operated continuously over 2 months without a shutdown. This record may well have been extended had there been continued demand for the equipment.

Operating costs . . . These are a prime consideration in the selection of any type of compressor-station installation. Fig. 2 is a summary of operating costs for turbine and reciprocating stations.

The stations considered are not a composite of all reciprocating stations on our transmission system but are specific ones which operate on a comparable load factor. These do not represent the cost which we would anticipate in a reciprocating station of today's design with automatic controls and the consequent lower personnel requirements.



MAJOR SAVINGS from installation of turbines has been operating labor. Fig. 2.

Labor savings . . . Fig. 2 illustrates that major savings from the installation of turbines has been operating labor. Our turbine stations are currently being operated with three men per tour. An engineer is responsible for operations and is headquartered in the control room which is separated from the turbine room. He is assisted by an auxiliary engineer and an oiler. The auxiliary engineer is required since our company elected to install separate engine-driven generators for power. He is also responsible for attending heating boiler, air compressors, water-treating equipment and other appurtenances. The oiler is primarily the engineers' communications contact in the compressor building. He also participates in general maintenance work and other utility service.

Low oil use . . . A factor favoring turbines is the low oil consumption for that machine as compared with reciprocating engines. The average reciprocating engine on our system develops 5,000 hp.-hr. for each gallon of lubricating oil while the turbines develop 55,000 hp.-hr. per gal. Another factor favoring the turbine plant is the smaller requirement for water makeup and cooling facilities. It should be noted that some of the difference in the amount of cooling involved is not inherent in the two applications, but is because no gas cooling is required at the low-compression ratios in the turbine stations.

The fuel costs which are compared in Fig. 1 are total station costs including auxiliaries. The cost figures shown are on the basis of rated horsepower, and do not take into account the extra horsepower developed by the turbine at lower ambient temperatures. With this consideration, the turbine plant is actually in a more favorable position with presently installed reciprocating stations than the graph indicates. Averages throughout the system indicate a station fuel consumption including all auxiliaries as follows:

1. Gas-turbine stations—10,400 B.t.u. per b.hp.-hr. developed.
2. Vertical gas-engine stations—9,200 B.t.u. per b.hp.-hr. developed.
3. Horizontal gas-engine stations—10,600 B.t.u. per b.hp.-hr. developed.

Maintenance

Turbine-plant maintenance requirements and costs are still a relatively unknown factor so far as Northern is concerned. Currently one turbine has been inspected and overhauled at each

"The three-unit turbine stations were built for $270 per rated brake horsepower while a reciprocating station of similar size was built for $274 per rated brake horsepower. Factors favoring turbines is low oil consumption and smaller requirement for water makeup and cooling facilities."

of the two turbine stations. This, however, was not done because of the mechanical condition of the equipment, but we felt it was essential to obtain a basis for anticipating future overhaul requirements. Other considerations favoring this program were to prevent the necessity for overhauling all units the same year and to have trained maintenance personnel when overhaul became a necessity.

Overhaul . . . Essentially, we feel that the experience gained outweighed the early expenditure. At this time, we were able to use our own operating personnel to conduct the inspection. This afforded a twofold advantage in that we pursued this work without increasing our own staff and provided an opportunity for the operating personnel to improve their knowledge of the fundamental composition of the machine.

The only additional help involved was a representative of the turbine manufacturer who was retained throughout the inspection in an advisory capacity. On the basis of the experience obtained at these two locations, we will again this year inspect and overhaul one unit per year at each plant which, if carried out, will make a 4-year overhaul cycle. So long as our fluctuating load factor remains as it is, this cycle will involve approximately 15,000 operating hours per unit between major inspections.

If the two turbines which we have inspected are indicative of what we may expect in the future, the maintenance picture is an encouraging one. The internals of both machines were found to be generally in good condition with some relatively minor exceptions.

Shown in Table 2 is a breakdown of the man-hours expended in major inspection on the No. 1 gas turbine at Tescott. We are convinced that the number of man-hours shown will be less as the personnel becomes more familiar with inspection and overhaul procedures. The man-hours for major turbine inspection as shown in Table 2 are considerably less on a rated-horsepower basis than those we have experienced at our reciprocating stations.

When evaluating a maintenance program, a spare-parts stock must be maintained to assure efficient operation. The stock of parts to accomplish this is a very complex thing to define and varies considerably between transmission companies. Northern's spare-parts stock inventory is $5.70 per brake horsepower for turbines which is considerably higher than the $3.15 average for reciprocating stations having vertical gas-compressor engines.

STATION TIME RECORD			
Description	Percent of Total Possible Operating Hours		
	Gas Turbine Station	Horizontal Engine Station	Vertical Engine Station
Hours Operating	33.16	37.78	29.67
* Dispatching Orders	58.35	60.19	68.76
Total Availability	91.51	97.97	98.43
Downtime			
Equipment Failure	4.50	0.30	0.17
Overhaul & Inspection	3.99	1.73	1.40
Total	100.00	100.00	100.00
* Equipment is operable but not required			

TABLE 1

MAN HOURS EXPENDED TO OVERHAUL ONE 5700 H.P. GAS TURBINE AT TESCOTT, KANSAS		
Disassembly		
Axial Flow Compressor	46:30	
Turbine Assembly	185:30	
Controls and Accessories	38:45	
Total Man-hours, Disassembly		270:45
Cleaning of Parts		196:15
Assembly		
Axial Flow Compressor	30:30	
Turbine Assembly	289:00	
Controls and Accessories	48:30	
Total Man-hours, Assembly		368:00
Total Man-hours to Overhaul		835:00
Man-hours by Manufacturers' Representative		128:00

TABLE 2

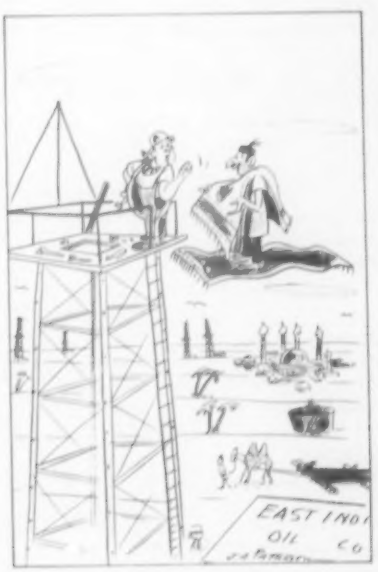
New microwave link joins four-state area

A NEW 162-mile microwave link has been added to the R.C.A. radio relay system used by Colorado Interstate Gas Co., Colorado Springs, for voice communication and control services in a four-state area.

The extension link runs from Keyes, Okla., to Bivins, Tex., and from Colorado Springs to Denver. It is fully integrated with the original 483-mile system installed in 1954.

The integrated microwave network, which now totals 645 miles, links Colorado Interstate Gas Co. at Colorado Springs with its pipeline compressor stations and gas-producing fields in Colorado, Kansas, Oklahoma, and Texas.

The microwave extension link, as well as the original system, utilizes standard microwave equipment operating in the 2,000 megacycle band. In addition to voice communications, the integrated system provides V.H.F. control circuits to provide communication among microwave stations and mobile units.



"Not today."

Here's what these Spectrometry Expressions mean . . .

1. **Mass or mass number.** A mass spectrometer measures the relative number of ions formed by electron bombardment of a molecule or mixture of molecules. Each ion has a mass number which is the ratio of the mass of the ion in atom mass units to the electrical charge on the ion. This ratio is also referred to as M/e.

2. **The number of ions present** is found by measuring the ion intensity. This is done by picking up the charges on a collector, amplifying the signal, and reading the signal. The signal is read by the degree to which a series of galvanometers is deflected or to which a pen recorder is deflected. To give a wider range in signal recording, so as to detect compounds present in high or low concentrations, a series of galvanometers of varying sensitivities is used.

The most sensitive has 3 times the sensitivity of the second, 10 times the third, and 30 times the fourth. Newer mass spectrometers have a fifth galvanometer which is one one-hundredth as sensitive as the most sensitive. In the case of a pen recorder, this range of sensitivities is obtained by means of an attenuater, which gives sensitivity factors of 1, 3, 10, 30, 100, 300, and 1,000.

3. **Peak.** A peak is the trace on the record produced when a galvanometer deflects and returns. It measures the intensity of ions at a given mass number. Because molecules are fractured by electron bombardment, ions of mass numbers, other than the molecular weight of the unfractured molecule, are produced. Thus, the term "parent peak" corresponds to the molecular weight of the molecule and is 72 for pentane, 70 for pentene, 58 for butane, 56 for butene, etc.

4. **Peak height** indicates the intensity of the ions at a particular peak (or mass).

5. **Sensitivity** describes the ratio of the intensity of the ions formed (peak height) at a given mass to the amount of the sample present for a particular pure compound. The amount of sample present is usually expressed in microns of pressure in the expansion volume of the mass spectrometer, but other references, such as a constant volume pipet for liquid samples, may be used.

Two time-saving "tools" make possible . . .

Gas and Plant-Stream

by Raymond J. Carroll

IN the present-day refinery or chemical processing plant, the need for more, faster, and more accurate analyses of plant gas and liquid streams is increasing. Results on samples are needed within minutes of their being submitted. Sample complexity has increased to where it is necessary to check for components from hydrogen to toluene or xylene in the same sample. Conventional chemical or distillation methods are too cumbersome or slow in many instances, and the number of people needed to analyze the samples required is too high in others.

In the Lake Charles refinery of Cities Service Refining Corp., the work output has been increased many fold, with corresponding decrease in manpower requirements, by use of mass spectrometer and infrared spectrophotometer techniques in the analysis of intermediate and final gas and liquid streams, as compared with low-temperature fractionation equipment.

The equipment consists of a Consolidated Electrodynamics Corp. Model 21-103 analytical mass spectrometer and a Beckman Model IR-2 infrared spectrophotometer.

The mass spectrometer is an early model purchased 11 years ago. It has been modernized and employs many of the advances which have been made, such as metal room temperature inlet system, micromanometer, and isatron analyzer assembly. A new amplification system is soon to be installed. Several minor modifications have been made by laboratory personnel.

The Beckman infrared spectrophotometer is also one of the earlier models. It is equipped with a modified metal gas-handling system, liquid sample holder, and strip-chart recorder. The majority of analyses performed, however, are on a point-by-point basis.

Although the mass spectrometer laboratory is air conditioned, the infrared section is not. Regular tap water is circulted through coils welded to the sides of the instrument and dry air is bled through the cabinet to protect the optics. Since the temperature of cooling water is relatively constant, summer and winter, the temperature of the instrument remains relatively unchanged. The instrument appears to operate very satisfactorily under these circumstances.

A Model 21-103 Consolidated analog computer is used for much of the calculation work, although a mechanical calculator is used to finish all analyses.

Authors are with Cities Service Refining Corp., Lake Charles, La.

Gas-Analysis Section

The gas-analysis section is staffed by five chemists and one physicist, in addition to the supervisor. Three of the chemists are employed in routine analysis. The other two are engaged in nonroutine analyses and special projects. The physicist is engaged in routine analytical work and also takes care of the routine maintenance of the instruments. The section is operated on a 7-day-week, 8-hour-day schedule. On occasion, it is necessary to operate on a three-shift or two-shift basis.

The major portion of the samples are analyzed on the mass spectrometer. However, since the mass spectrometer does go down for repairs, the infrared is kept calibrated for all possible samples. A typical month's analysis by the section would include 1,400 mass, 100

TABLE 1—TYPICAL MONTH'S ANALYSIS

Mass Spectrometer

Type sample—	Number	Time (man-hours)
A. Gas samples:		
21-component	110	¾
18-component	210	½
8-component	750	¼
8-component (L.P.G.)*	60	⅓
B. Liquid samples:		
Hydrocarbon type (P.O.N.A.)†	40	2
Aromatic breakdown	30	¼
C. Miscellaneous	180	1 avg.

Infrared Spectrophotometer

A. Gas samples:		
Single component	85	¼
B. Liquid samples:		
6-component	15	1½

Orsat Equipment

A. General gas samples	250	½

*Liquefied petroleum gas. †Paraffins, olefins, naphthenes, aromatics.

Analyses in a Hurry

and Charles L. McGehee

Infrared and mass spectra make for fast, accurate analysis, and for greater laboratory flexibility at Cities Service Lake Charles refinery

infrared, and 250 Orsat-type of analyses. These are broken down into gas and liquid analyses, and range from single to 21-component breakdowns. Table I gives a detailed summary of this typical month, along with approximate total manpower requirements in man-hours.

Samples Analyzed

Gases from catalytic cracking, reforming, and gas-recovery equipment are analyzed for 21 components from hydrogen to C_6 and heavier and for aromatics from benzene to the xylenes. An average C_6 and heavier cut is used to obtain a calibration pattern for each type of sample. Propane streams are analyzed for approximately 18 components from methane through the above-mentioned end points. Iso and normal-butane products streams are analyzed for C_3, C_4, and C_5 paraffin and olefin constituents.

Propane analysis . . . The N.G.A.A. specifications for commercial propane call for a minimum purity of 95 volume per cent propane, a maximum vapor pressure of 215 psig. at 100° F., a residue of not more than 2 volume per cent (this corresponding to a butane content of 1.2 volume per cent), a total sulfur content of not more than 15 grains per 100 cu. ft., a noncorrosive action toward a copper strip, and a low water content. While many of the N.G.A.A. tests are picturesque, they are too slow, require large quantities of sample, and hence are too hazardous and take up too much space in a busy laboratory.

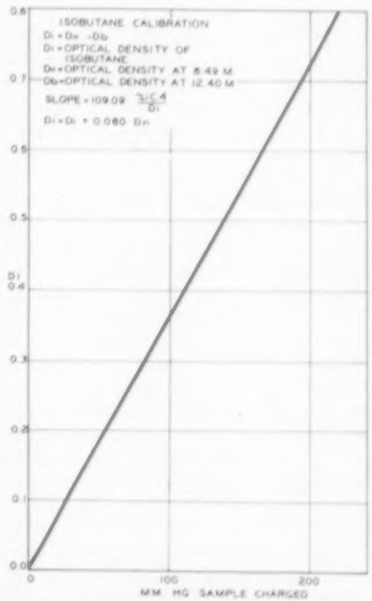
All of these tests but the ones for corrosion and moisture can be carried out with a single run on the mass spectrometer preceded by a "background" run. Because the propane in the sample is of such a high concentration, and the sulfur compounds are of such a low concentration, special techniques are necessary to measure both with one run. More than the normal amount of sample is charged to the instrument, which is operated at higher sensitivity than normal.

These factors enable trace amounts of sulfur compounds to be detected, but the parent hydrocarbon peaks in the spectrum will not appear on the chart because of their high concentration. To remedy this, heavy isotope peaks which are not as sensitive, are measured for the ethane (mass 31 rather than 30) and for propane (mass 45 rather than 44). The peak corresponding to mass 53 has about the same sensitivity for both normal and isobutane so this is used rather than mass 58.

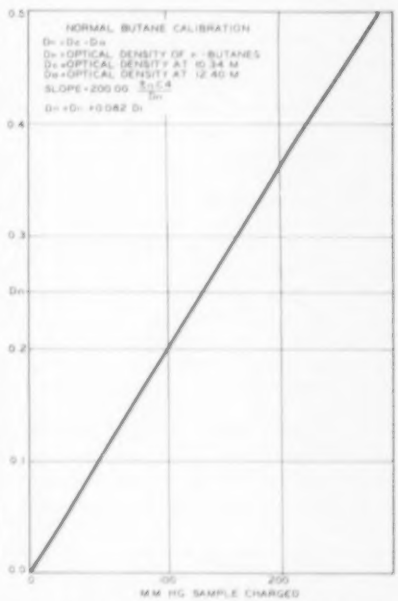
The sulfur compounds are detected at their usual molecular-weight masses. Corrections for interferences of propane to the ethane and sulfur dioxide to methyl mercaptan must be made. The percentages of hydrocarbons in the sample along with their molar properties give the liquid specific gravity at 60° F., and the vapor pressure in pounds per square inch gage at 100° F. For the sulfur concentration, the average molecular weight of the sample is calculated, then successively the mole per cent, weight per cent, and grains per 100 cu. ft. are derived. A complete analysis of commercial propane takes about 20 man-minutes including instrument and calculating time.

Liquid analysis . . . In the liquid-analysis field, a hydrocarbon-type breakdown of reformer feed and products as well as many intermediate streams is made into paraffin, olefin, naphthene and aromatic (P.O.N.A.) constituents. Modifications of the procedure described in Analytical Chemistry, by Brown and Young,[1] or Lumpkin and coworkers[2] are used. An aromatic breakdown based on Lumpkin's work, but using calibrations made by this laboratory and a reference standard of ethylbenzene is also used on finished-gasoline boiling-range materials. The conventional Kattwinkel method (absorption in sulfuric acid and phosphorus pentoxide) is slow and often gives high results.

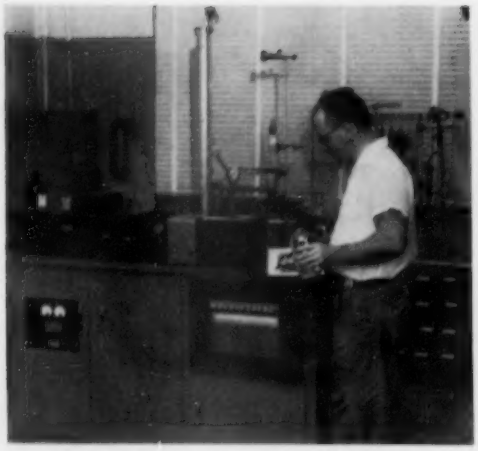
A liquid sample of 0.0005 ml. is introduced into the mass spectrometer through a mercury orifice system. Immediately after the sample is run, the same volume of pure ethylbenzene is run. The aromatic hydrocarbons in the sample are easily calculated from their characteristic peaks. The ethylbenzene is used to compensate for fluctuations in sensitivity. A relationship between



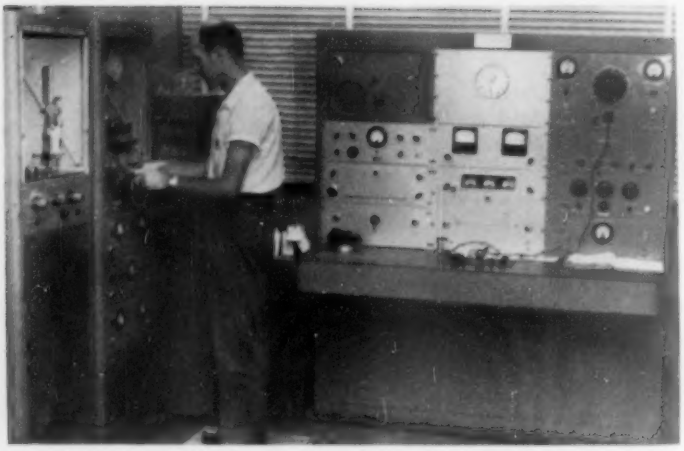
ISOBUTANE CALIBRATION CHART for use in butane analysis. Fig. 1.



n-BUTANE CALIBRATION CHART for use in butane analysis. Fig. 2.



INFRARED SPECTROPHOTOMETER with Orsat equipment, sampling system, and calibrating material in the background. Author Carroll logs in a liquid sample to be analyzed.



MASS SPECTROMETER is valuable for refinery analysis. Author McGehee is charging a liquid propane sample to the gas-inlet system. Mercury orifice system used for sampling liquids is at left background.

this ethylbenzene and the one run when the other calibrations were run is calculated. This relationship is applied to the per cent aromatics derived from the calculation to give a true per cent aromatics.

Instrument time and calculating time amount to 15 minutes per sample if only one sample is run. If more than one sample is analyzed at one time, it is necessary to run only the one ethylbenzene sample, and total time per sample is thereby reduced.

Complementary techniques . . . Although the mass spectrometer is a very versatile tool, it cannot do everything. In many instances it cannot separate isomers of the same molecular weight. In other instances, interference from other components is so great that proper analyses cannot be made. In these instances complementary techniques must be used. This is accomplished by the use of the infrared spectrophotometer.

One instance where infrared must be used to complement the mass spectrometer is in the separation of the butylene isomers in a butane-butylene sample, a feed stock for butadiene production. The mass spectrometer will not separate these and it is necessary to use the infrared either to get only the isobutane by the base-line method or all butenes by the usual matrix procedure.

A second example of the need for complementary analyses is in the separation of the xylene isomers in Hydroformer products. Mass-spectrometer techniques give a reliable and reproducible analysis of a sample containing paraffins, naphthenes, benzene, toluene, total C_8 and C_9 aromatics. The C_8 aromatics can be broken down into ethylbenzene and total xylenes, and the xylenes cannot be separated. On the other hand, infrared methods break the aromatics into their individual components, but the total aromatic content is not as reproducible.

Thus, a combination of the two methods is used. The value of the total aromatics by infrared is normalized to that by mass spectrometer, and the total xylenes and the ethylbenzene found by the two methods are compared. If good checks are not obtained, the sample is rerun. If good checks are obtained, the xylene distribution from the infrared run is applied to the total xylenes by mass spectrometer.

Infrared instrument and calculating time amounts to 1.5 hours, while the mass-spectrometer instrument and calculating time amounts to 0.5 hour, or a total time of 2 hours. It should be pointed out, however, that the above-mentioned infrared procedure cannot be used if the sample has over 2 per cent C_9 aromatics, or a high concentration of saturates.

Butane analysis . . . At one time it was found necessary to run analyses on a great number of butane tank-car shipments. As the mass spectrometer was being operated at maximum capacity, it was desirable to develop a rapid analytical method for butane analysis by infrared. A short-cut method similar to the two-point method for isobutene was devised. Isobutane was measured at 8.49 μ, normal butane at 10.34 μ, and other interfering saturated hydrocarbons at 12.40 μ. Calibration charts were made, in one of which the optical density of the isobutane minus 1.4 times the optical density of the interfering hydrocarbons was plotted against the per cent isobutane (Fig. 1).

In the other chart, the optical density of the normal butane minus 1.4 times the optical density of the interfering hydrocarbons was plotted against the per cent normal butane (Fig. 2). A pressure of 250 mm. mercury of the pure sample in the sample cell was taken as 100 per cent while 0 mm. mercury was taken as 0 per cent. The fact that unsaturated hydrocarbons in the sample give erroneous results is not a great detriment, as all samples not meeting specifications were checked on the mass spectrometer. One man can run and calculate 30 samples in an 8-hour shift by this method, but it must be emphasized that for really accurate analysis the sample cannot contain any hydrocarbons other than propane, isobutane, normal butane, and iso and normal pentane.

Calculation of the analysis of a typical butane sample is shown in Table 2.

Calculation techniques . . . Although calculating techniques vary for each instrument, in general it can be said that calibrations are made with research-grade hydrocarbons, usually Phillips or National Bureau of Standards, and interference matrices are set up. The

THE AUTHORS

Raymond Carroll received a B.S. in chemistry from St. Michael's College, Winooski Park, Vt., in 1942, and has done extension graduate work at Louisiana State University. He was employed by Cities Service Refining Corp. in 1943, and was associated with its butadiene laboratory as a chemist and supervisor in Lake Charles until 1950. At that time he became supervisor of the gas-analysis laboratory at the Lake Charles basic refinery.

Charles McGehee received a B.S. in chemistry from Missouri School of Mines and Metallurgy in 1948. He did graduate work at Iowa State College, and has done extension graduate work at Louisiana State. Employed by Cities Service since 1949, he was associated with chemistry section for 2 years and has been in the gas-analysis section for 5 years.

TABLE 2—CALCULATION OF THE ANALYSIS OF A TYPICAL BUTANE SAMPLE

$D_a = 0.942 \qquad D_c = 0.013 \qquad D_b = D_d = 0.050$

$D_i = 0.942 - 0.050 \times 1.4 + 0.013 \times 0.080 = 0.873$
$D_n = 0.013 - 0.050 \times 1.4 + 0.942 \times 0.082 = 0.020$

Mole per cent $iC_4 = 0.873 \times 109.09 = 95.24$
Mole per cent $nC_4 = 0.020 \times 200.00 = 4.00$

Liquid per cent $iC_4 = 95.24 \times 1.0301 = 98.11$
Liquid per cent $nC_4 = 4.00 \times 0.9931 = 3.97$

102.08

These results are normalized to 100 per cent or 96.1 liquid volume per cent iC_4 and 3.9 liquid volume per cent nC_4.

unknown mixture readings are then inserted into the matrix. From this point, the calculation is mainly the solution of simultaneous equations. This is accomplished on a mechanical calculator using inverse equations or on a computer or calculator using the direct iterative or successive approximation methods. The results of these matrix calculations are either liquid or mole volume per cent depending on the way the matrices are set up originally.

In some instances where calibrating compounds are not available, a Keysort file of mass spectra is consulted and literature values are adjusted to the instrument and calculations made on this basis. The accuracy in this case will be between 5 and 10 per cent of the actual amount present. A file of infrared spectra is also available for use. However, this is usable only for qualitative work.

In practice, a calibration of the mass spectrometer is made for all components to be analyzed on a routine basis. Several control blends are made in a gas-blending system, to correspond to the various types of samples already described. A daily check with normal butane and frequent checks of these blends are made. Minor changes in operating conditions can be taken care of by recalibration for only those components which appear out of line. However, when the analysis of known blends goes too far out of line, a complete new calibration is made.

Although it is very difficult to make a blanket statement as to the accuracy of the mass-spectrometer analysis, in general it can be said that with a good calibration, an accuracy of plus or minus 1 per cent of the amount present can be maintained. On samples with high concentrations of one or two components, the accuracy of these components can be increased. On samples with components below 10 per cent concentration, inaccuracies of 0.1 to 0.3 per cent absolute may be noted.

These same points on calibration generally hold true for the infrared spectrophotometer, too.

Nonroutine work . . . In the gas-analysis laboratory there is a great demand for nonroutine investigations of all kinds. Most of these investigations are done on the mass spectrometer. Here are some typical examples:

1. The concentration of isopropyl alcohol found in some gasolines can be determined by mass spectrometer in about 15 minutes.

2. While the total paraffin, naphthene, and aromatic contents of a naphtha are easily determined by mass spectrometer, a breakdown of the individual compounds making up the sample requires a rather large number of distillation cuts which are then analyzed by the mass spectrometer.

3. The methyl ethyl ketone content of a vacuum pump discharge from a wax plant can be found by mass spectrometer.

4. The cause of the odors found in various gas streams can be investigated by both mass spectrometer and infrared.

5. The presence of peroxides and hydroperoxides formed in hydrocarbon liquids can be determined by infrared techniques.

6. Air-pollution studies have been made by trapping the condensable gases from a metered quantity of air and analyzing the trapped material by mass spectrometer.

7. Because of their high sensitivity, aromatic hydrocarbons in very small concentrations may be determined by mass spectrometer.

Maintenance Problems

Service contracts with the manufacturer of the instruments concerned have been found to be well worth the cost. These vary from two 1-day visits per year for the infrared to two 3-day visits per year for the mass spectrometer. During these visits any irregularities are taken care of by the company engineer and certain routine checks are also made. Although the amount of actual down time will vary with the types of work done, a monthly check of tubes, vacuum systems and electronic circuits will keep it at a minimum.

If the instruments are not overloaded, taking care of trouble as it appears will save considerable grief later. If the instrument is run when not in peak operating condition, a much longer repair time will be necessary.

During 1955, the laboratory experienced about 10 days of inactivity on the mass spectrometer. The infrared was out of operation a total of about 5 days. Since we analyze many samples with hydrogen sulfide and similar corrosive materials, along with high-aromatic components, which are very hard on the tungsten filament, the most frequent causes of trouble are high-voltage flashing due to dirt in the ionization chamber and burnout of the filament due to the reaction of the materials analyzed.

The control circuits will cause difficulty sometimes, but these can usually be resolved quickly, although at times locating the trouble can be rather frustrating. The Nernst glower and heater assembly gives the greatest amount of trouble in the infrared instrument. We have operated the mass spectrometer for as long as 18 months, analyzing 14,500 samples to as short as 3 days and 95 samples on a single filament assembly. It is rather hard to predict how long a filament will last.

Analysis time . . . On occasion, a rush analysis for a neighboring plant is needed. The sample, which contains C_3's C_4's, and C_5's is brought to this laboratory from the plant 8 miles away. The sample is run, calculated, and the analysis phoned to the other laboratory in less than 1 hour from the time the sample is taken in the plant.

In another instance, several samples must be analyzed and results compared for accounting purposes in as short a time as possible. By use of mass spectrometer-infrared techniques, approximately 4 man-hours are needed to analyze these samples. By conventional distillation and infrared techniques in the other laboratory, nearly 30 man-hours are needed to do the same job.

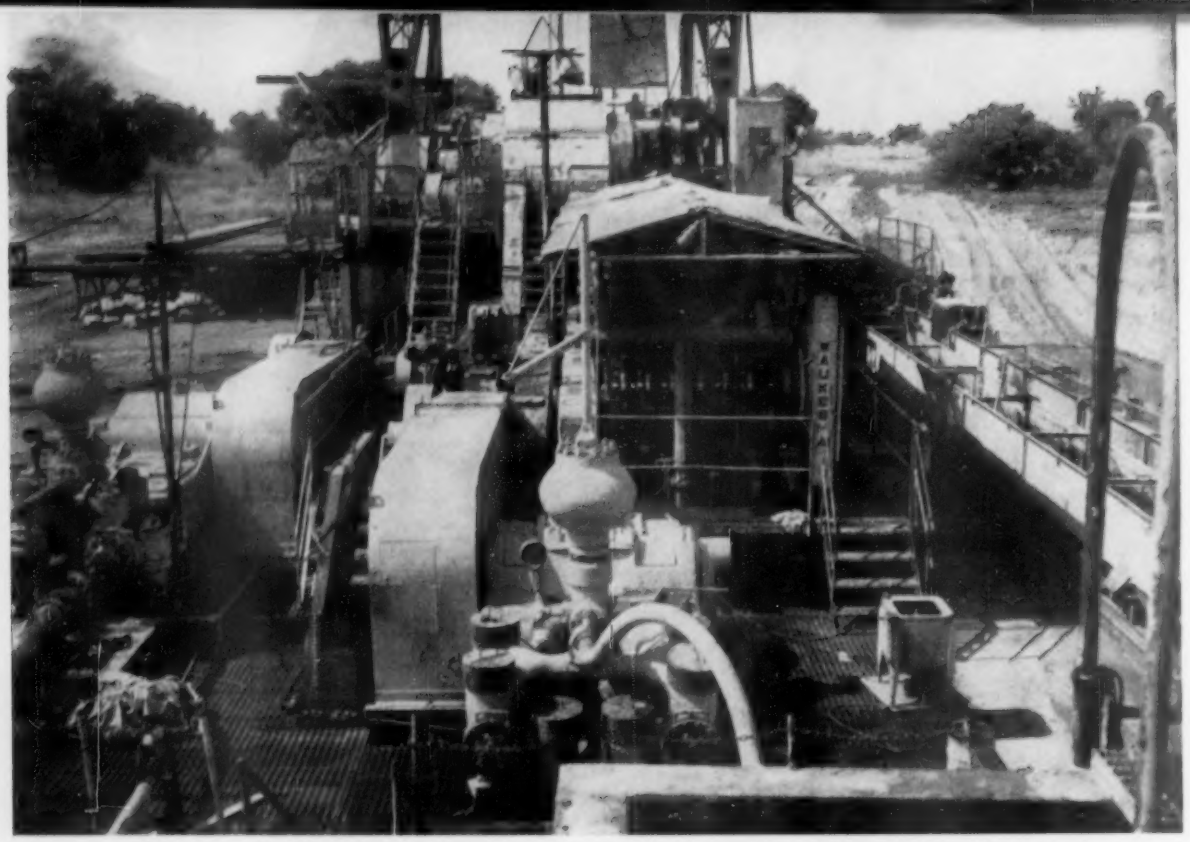
Mass-spectrometer and infrared-spectrophotometer techniques can increase the output of a control laboratory, but these instruments are not cure-alls and will not do everything.

Bibliography

1. Brown, R. A., Analytical Chemistry 23, 430 (1951).

2. Lumpkin, H. E., and Thomas, B. W., Ibid. 23, 1738 (1951), 24, 1389 (1952).

3. Infrared Instruments, Beckman Instruments, Inc., Fullerton, Calif.; Mass Spectrometer, Consolidated Electrodynamics Corp., 300 North Sierra Madre, Pasadena, Calif.



HORSEPOWER, mud circulation, automatic driller, and air-powered pipe handling are designed to let the rig make hole faster.

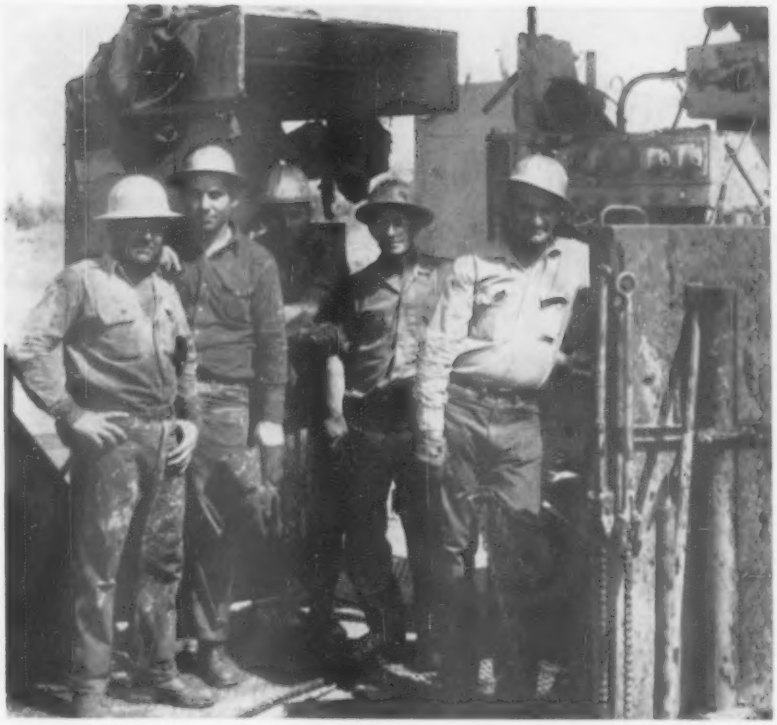
They Call It's Setting

A "PACE-SETTER" rig used by Shell Oil Co. in Strand field, central San Joaquin Valley, has established some excellent drilling marks.

The last three 9,600-ft. wells drilled by the rig reached total depth in 16 days. The upper 7,000 ft. of hole was drilled in an average of 9 days.

The fast drilling pace is attributable to several factors. Four most important are:

- Adequate horsepower, and the flexibility to apply it either to the draw works or either of two pumps.
- A well-designed hydraulics system which permits large volumes of



EXPERIENCED CREWS help make every minute count. Drillers have served from 12 to 30 years on rigs. This crew is, left to right, L. O. Moore, L. E. Evans, V. F. Furry, Edward Greenlee, and driller Monroe Beaver.

It the "Pace-Setter"— Some Remarkable Records

by D. H. Stormont
District Editor

mud to be circulated at high pressures.

- Wide use of air-powered pipe-handling equipment, automatic weight and feedoff control, and other devices which make for faster drilling.
- And, coupled with these, the drilling crews are long on experience. All drillers have served from 12 to 30 years on the rig floor.

The heavy rig, equipped with five in-line 300-hp. gas engines, is designed for depths up to 13,000 ft. In drilling the main hole normally two engines feed through the compound to the rotary and the other three power a 750-hp. tail pump. Or two engines can be used to power a 350-hp. pump. In coming out of the hole, four engines are applied to the draw works.

Drilling program . . . In order to slash costs, Shell is drilling a reduced-size hole in developing the basal Stevens (Miocene) pay. A 12½-in. hole is drilled to about 1,000 ft. and 9⅝-in. casing cemented. An 8¾-in. hole then is drilled to total depth and a 5½-in. oil string run. About 25 bits are required for the main hole.

As 5-in. drill pipe is used, high annular rising mud velocities are attained. In drilling the main hole a mud circulation of about 450 g.p.m. is used, at a pump discharge pressure of 1,600 to 1,700 psi. The large mud volume, coupled with the relatively small annular space, results in a rising mud velocity of about 215 ft. per minute.

The formations penetrated are predominantly sand and shale. Rotary speeds in the order of 250 r.p.m. are used, along with bit weights of 30,000 to 40,000 lb. Eight 7-in. drill collars are used. Weight on the bit is automatically regulated by hydraulic feed-off control.

Power equipment . . . An air-operated winch installed on the monkey board behind the derrickman has been quite helpful in handling drill collars. Its use has resulted in average round-trip time being reduced by about 10 minutes. The winch supplies the power to pull the drill-collar stands back behind the drill-collar finger when coming out of the hole. It also is used to position the stands for engagement with the elevators when going in the hole.

The method used at the Strand rig for handling the drill-collar string when a bit needs changing is as follows: (1) The first stand is pulled and lowered into the mouse hole; (2) the second stand is pulled back into the finger, using the air winch; (3) the third stand then is left hanging in the elevator. Pup joints are added if needed to expand each stand to 90 ft. Lifting nipples are used for handling the collars.

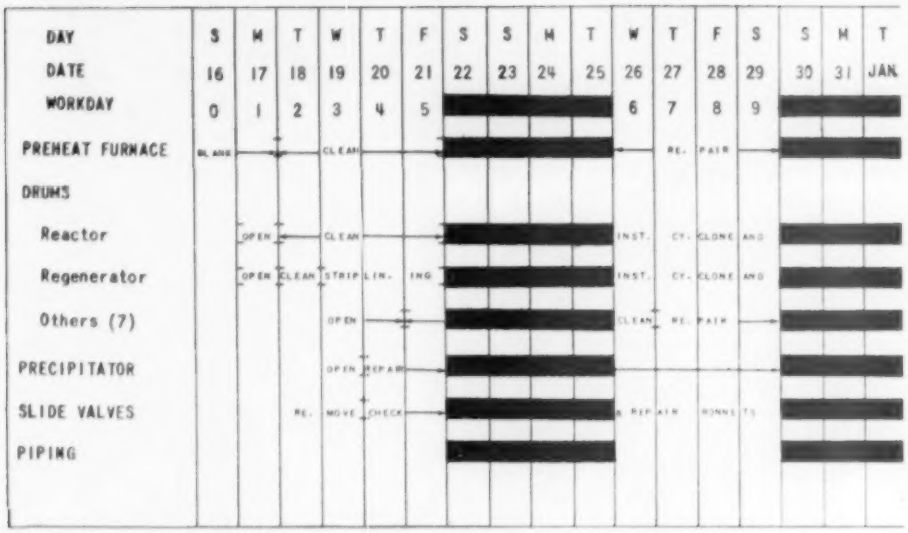
A similar air winch on the derrick floor is used to pull drill-pipe joints into the V-slot and position it in the mouse hole. Other jobs usually performed with the cat line are handled by this air winch.

Air-operated pipe tongs and power slips make for faster, safer handling of the drill pipe in and out of the hole. An air-motor-powered traveling crane, controlled from the derrick floor, unloads heavy equipment from the truck bed directly to the derrick floor.

Exclusive of drill pipe, the rig is hauled in 30 truck loads on off-highway moves. About 1 day is required in tearing out and getting ready to move. Because of the many unitization features incorporated in the rig, normally a new hole is spudded about 2 days after dismantling starts.

The rig is Shell's way of testing maximum efficiency of methods in the industry. But as Lee Sargent, tool pusher in charge of the rig, expressed it: "We are not trying to set any records; we are just trying to give the company a good day's work."

Maintenance of Catalytic Cracking Units—6



Here's a blueprint for . .

Planning and Executing a Turnaround

Cat cracker turnarounds proceed much more smoothly when they are well planned and executed according to plan. Here are concrete ideas for speeding the operation, including use of a number of labor-saving devices.

by J. S. Clarke

FIRST step in planning for a scheduled turnaround of a catalytic cracking unit is to prepare lists of work to be done during the shutdown. These lists are prepared by any department concerned with operation or upkeep of the unit such as process, equipment inspection, electrical, instrument, etc.

For items of a maintenance nature, work lists should be submitted as late as possible so that all items will be included.

Where unit changes are involved, the submission date should be as early as possible to provide the necessary time to obtain items of equipment and materials.

In new units or where there is lack of background experience on the part of operating and maintenance personnel, it will be necessary to anticipate the nature and extent of maintenance work. In any case, some degree of anticipation is involved on maintenance items since the actual condition of many pieces of equipment in the plant cannot be determined accurately until actual inspection after the plant is down.

Lack of experience or unanticipated repairs are bound to extend the turnaround. As experience is gained, however, routine work may be estimated more accurately and future turnaround periods shortened.

Author is with Esso Research & Engineering Co., Linden, N. J.

Master work list . . . The individual lists from the various departments are submitted to the regional engineer or construction and maintenance engineer who will be responsible for planning and executing turnaround. The various job lists are consolidated into a preliminary over-all work list and a meeting is then held to review the entire list of work.

In this meeting the work list is reviewed from the standpoints of necessary down time, materials availability, determining what jobs must get approval for capital expenditures, etc. The preliminary list is modified as required and is then published and distributed as the master work list.

Each job should be well defined on the master work list. Appropriate charges are assigned to each job and the mechanical trades involved in each job are listed. It is well to arrange the various jobs on the master work list into designated sections of the unit so that work in these sections can be effectively organized. An example of a typical division of a unit into sections for turnaround purposes is as follows:

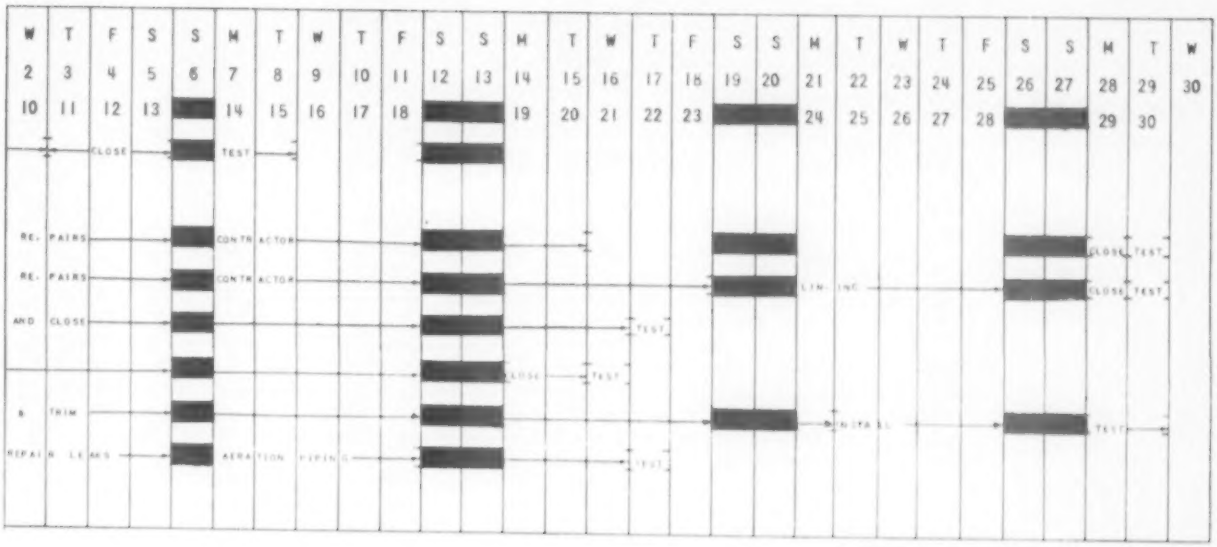
1. Fractionating section.
2. Gas compression section.
3. Catalyst section.
4. Light ends.

The list may be further segregated into items of a general nature or a specific nature such as:

1. Blanking list (all unit sections).
2. Electrical work (all unit sections).
3. Instrument work (all unit sections).
4. Slide valves.
5. Field sketches.

Further meetings . . . Following distribution of the master work list, further meetings are held periodically, attended by representatives of the process department, the equipment-inspection department, and the mechanical-trades foremen during which the list of jobs is reviewed for clarification and changes, if necessary.

As soon as possible, a consolidated materials requirement list is prepared and forwarded to the stores department as advance notice of materials required.


W T F S S M T W T F S S M T W T F S S M T W
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
CLOSE
TEST
RE- PAIRS
CONTRACTOR
RE- PAIRS
CONTRACTOR
AND CLOSE
TEST
CLOSE
TEST
TRIM
REPAIR LEAKS
AERATION PIPING
TEST
CLOSE
TEST
CLOSE
TEST
CLOSE
TEST
LIN- ING
TEST

TYPICAL ITEMS listed on a turnaround planning chart. Fig. 1.

This list is promptly returned and shows status of materials involved. Stock symbols and quantities on hand or on order are given for reference during the turnaround.

The preliminary work lists are examined for items which can be prefabricated ahead of the shutdown. This includes reconditioning of spare equipment such as slide valves and pump cases so that replacement rather than repair work will be done during the turnaround. Sufficient priority is assigned in the shops to this work to assure maximum prefabrication. This procedure is doubly important in that it relieves the shops later when large volumes of work are sent in from the unit.

Large pieces of material and equipment to be used in repair of the unit are moved to the site prior to shutdown. This includes such items as scaffolding, rigging equipment, motors, instruments, lining materials, welding machines, piping, valves, etc. A general area should be assigned for this purpose.

All necessary blanks should be on hand at the unit before it is shut down. A public-address system and sound-powered telephones should be installed prior to the turnaround. In general, everything that can be done ahead of the shutdown is done.

A turnaround planning chart usually is prepared from the master work list before the shutdown. This chart shows the work plan in an eye-catching way and also provides a ready means of following turnaround progress.

The day of the week, date, and work day are shown across the top. Major equipment or jobs are listed down the chart. The desired work schedule is shown by horizontal bars with spaces below to plot actual progress. A typical turnaround chart is shown in Fig. 1.

Organization

The close control of men, materials, and workmanship, and the influence of complete coordination on the time element are the factors which lead to successful short turnarounds. To do this, adequate and capable supervision must be provided in the right places.

Common practice at many refineries is to divide the unit into sections and assign a regional engineer and appropriate mechanical trade foremen and mechanical tradesmen to each of the sections. The regional engineer and mechanical trades foremen are responsible for the required jobs in their section. Fig. 2 shows a typical turnaround organization with the unit divided into the following sections:

Section 1—Fractionating side (including flue gas boilers, strippers, pumps, and exchangers).

Section 2—Gas compression plant (may include some pumps and exchangers from the fractionating group depending on geographical location).

Section 3—Catalyst side.

Section 4—Light ends.

Turnaround coordinator . . . The turnaround coordinator usually is the unit regional engineer. Other regional engineers in charge of the various sections may be borrowed or reassigned from other units or areas. The coordinator sees to it that materials are ordered and on hand. He also contacts engineering for assistance on new jobs or for special-design drawings or materials and sees that log books and progress charts

MECHANICAL SUPERVISION COVERAGE, typical turnaround organization. Fig. 2.

of the turnaround are properly maintained.

Mechanical-trades foremen are assigned to the various sections wherever possible. Experience has shown that it is desirable to have at least one trades foreman for every 15 tradesmen.

If there are a number of anticipated bottleneck jobs, it may be well to select a trades foreman and designate him as job supervisor to move and direct men of all trades on a particular job.

A clerk is assigned in the coordinator's office to handle the public-address system, to receive incoming telephone calls, to contact the turnaround supervisors via the public-address system, and to relay messages regarding material, jobs, or manpower.

Shops coordinator . . . In some refineries a supervisor is assigned as turnaround shops coordinator. Function of this supervisor is to keep in close touch with the progress of work at the unit and to advise and coordinate the efforts of the shops in turning out work needed for the unit. There's always a lot of shop work of all kinds involved in a turnaround. Field progress depends heavily on having the right equipment on hand when it's needed.

Often the engineering division has provided a representative to follow work in the field. This has been very helpful. It's not always possible to have all drawings in the field by the time the turnaround is begun and his direct association with the field work speeds preparation of drawings and helps interpret them.

Execution

The coordination center, usually a mobile trailer or one corner of the control room, serves as the nerve center for the turnaround. The final master work list, together with drawings and sketches, is used as a basis for estimating numbers of crafts needed at the start of the turnaround. As the turnaround progresses, changes in the planned scope of work and manpower usually are necessary depending on the results of actual inspection of equipment.

To do this, the inspectors prepare written job requests which are reviewed and approved by the turnaround coordinator. Copies of these job requests are given to the respective crafts through the section engineers and upon completion are placed in a completed file.

Job coordination . . . All work is channeled through the turnaround coordinator to the regional engineers in charge of specific sections of the unit. It is the function of the turnaround coordinator to coordinate all sections of the unit, to see that they are properly manned so that all jobs are completed in the least possible time and with proper interrelation with one another.

Bottleneck jobs may be given special attention and any special problems regarding repairs may be handled jointly by the turnaround coordinator and the section engineers. Work in each of the sections is reviewed and organized with the respective mechanical-trades foremen by the responsible section engineer.

A meeting is held each day of the turnaround attended by the turnaround coordinator, the section engineers, and the mechanical-trades foremen to review and discuss jobs of major importance, to review allocations on major jobs, to discuss material holdups and expediting, to review holdups on field work due to shop fabrication or repairs, to plan mechanical manpower shifts, and to plan the work for the following shift or day. In some cases two daily meetings are held, one at the beginning and one at the end of the regular working period.

Bottleneck jobs are identified and analyzed as to whether or not job supervisors should be appointed to expedite progress.

When the unit has been down long enough to estimate the effect of the major repair jobs which were not known beforehand, a fairly firm completion date for the turnaround is set and this becomes the target date for the completion of all jobs.

Following the turnaround, many refineries hold a post-turnaround meeting to review and record methods and suggestions in the light of recent experiences for improved planning and execution of the next turnaround.

Labor-Saving Devices

The following is a list of equipment which has been found useful during the turnaround of catalytic cracking units.

Haul-away boxes and pallets. Pallets and fixed dimension boxes are used in handling materials both during turnaround and also during normal maintenance periods. Use of this equipment has eliminated many man-hours of work in double handling of materials. It also makes for orderly arrangement of materials, which, in turn, is good housekeeping.

Concrete scrubber. Portable steam-injection cleaners have been used successfully in washing up oil spills around the equipment containing aromatic oil and other heavy oils. Both powdered and liquid detergents have been used with best results being obtained by the latter. The detergent is mixed with water in a closed chamber and steam is used to heat the liquid and to jet the mixture under pressure on the area to be washed.

Tool and stores trailer. Present-day practice is to bring a mobile trailer to the job site supplied with most all small tools and stock material that may be needed for the turnaround. All material in the trailer is charged to the turnaround job number. An inventory before and after the turnaround shows the amount of material used, and all material left over is returned to stock, with the proper credit being made.

Individual requisition orders are not required and this eliminates much paper work and delay. Stock for the trailer is listed beforehand by the maintenance and construction engineer emphasizing special as well as routine materials.

The attendants supply any tool requested of them by keeping in contact with the central tool rooms. By having the attendant in the trailer at the turnaround procure the tool needed, a source of wasted time is eliminated. Two windows are used for issue, one for material and the other for tools.

The following direct advantages result from having the tool and material trailer on the turnaround:

1. Materials and tools are handy at the job site. No time is lost in trips to outlying tool cribs or warehouses.

2. No time is lost in waiting for delivery.

3. The use of power and special tools is encouraged.

4. Material is kept in one place, helping housekeeping.

5. Better control and use of tools is gained. When a craftsman finishes with a tool, he turns it in for reissue.

6. The trailer takes back all unused material and tools, eliminating post-turnaround inventories and stock pick-ups.

Cranes. Large and small mobile cranes are being used effectively during turnarounds in dismantling and erecting piping and handling exchanger bundles, pumps, motors, furnace tubes, etc. Such cranes can be brought to the unit very quickly when the need for their use arises.

Portable scaffolds. Collapsible, portable, light-weight aluminum scaffolds are used with much success, both at the ground elevation and on the unit structures. Simplicity of design permits their erection by individual crafts. They are available in 6-ft.-high increments that may be stacked three high, or a height of 18 ft., and may be dismantled and passed through elevator doors.

Thirty - two - volt transformers. Multiple-outlet 32 - volt transformers are used quite extensively which are plugged into the 110-volt lighting circuits at

various locations for work requiring light extensions. The various crafts draw 32-volt extensions from the point of supply and plug them into the transformer outlets, thus providing safe low-voltage lighting. This method reduces the number of 110-volt lighting fixtures that would normally be required for plugging in extensions.

Portable freight elevator. The use of portable freight elevator erected alongside the structure to relieve the plant elevator from hauling all materials speeds materials handling.

Public-address system and sound-powered telephones. As part of the preturnaround work, a public-address system and sound-powered telephones are installed on the unit. Speakers for the public-address system are placed around at convenient locations on the unit, with the control point in the turnaround coordinator's office handled by a clerk.

Sound-powered telephones are located at various levels of the structure so that the mechanical-trades foremen can answer a call relayed through the public-address system. The control point for these telephones is also in the turnaround coordinator's office. These systems have been found to greatly reduce time lost in contacting personnel.

Portable vacuum cleaners. Portable vacuum cleaners are used to advantage even in cases where a vacuum system is built into the unit. Experience with the use of these portable vacuum cleaners has indicated that time required to clean lines and vessels previously can be reduced by as much as 75 per cent.

Small air-chipping guns. Where extensive internal refractory repairs and renewals are required in lines and vessels, it is desirable to have on hand a number of small air-operated impact guns. The pneumatic, retainer type of guns is suggested.

Portable water coolers on unit. Installation of water coolers on every floor of the unit structure is well justified in saving lost man-hours of tradesmen otherwise having to go from a high elevation to the ground for water.

Oxygen manifolds in structure. Several of the domestic refineries have installed piping in the structure for distribution of oxygen used in burning operations. A 1½-in. header extends from the ground to the top of each unit, with ¾-in. outlets at various floors.

Oxygen is purchased in 11,000-cu.-ft. trailers which are parked at the unit and tied into the system. This eliminates the handling of many 244-cu.-ft. drums and assures an ample supply of oxygen on all shifts. A considerable cost saving is realized by the use of bulk oxygen rather than bottled oxygen.

Continuous corrosion tester developed

PHILLIPS PETROLEUM CO.'s natural-gasoline department has developed the continuous corrosion tester to measure corrosion rates in a given environment while the unit is in operation. This makes it possible to obtain data on corrosion rates in a vessel, gasoline transfer line, return condensate, or water line without interrupting production.

The present practice of removing a unit from operation to visually inspect the vessels and piping is time consuming and expensive. Furthermore, considerable metal loss may have occurred and some equipment may have been badly damaged before a corrosive condition is known to exist.

The unit is constructed from heavy 1-in. stock with a packing gland in the upper 3 in. and the lower part of sufficient bore to retract two ½-in. by 3-in. by ⅛-in. metal coupons. The coupons are attached to a ⅜-in. stainless-steel plunger, which can be retracted into the barrel while the corrosion tester is screwed in a 1-in. gate valve. The gate is opened, the packing-gland nut tightened to prevent any leaking, and the coupons placed in the material to be tested by pushing the plunger through the holder the proper distance and locking it in position with a lock nut. The previously calibrated coupons are removed after about 30 days, cleaned, and recalibrated. The loss of metal is used to determine rates of corrosion. With this information a corrosion-control program can be initiated before an appreciable amount of the metal has been lost.

CORROSION TESTER is screwed in a 1-in. gate valve.

WELDING metal can be used to build up worn valves.

Worn valves can be salvaged

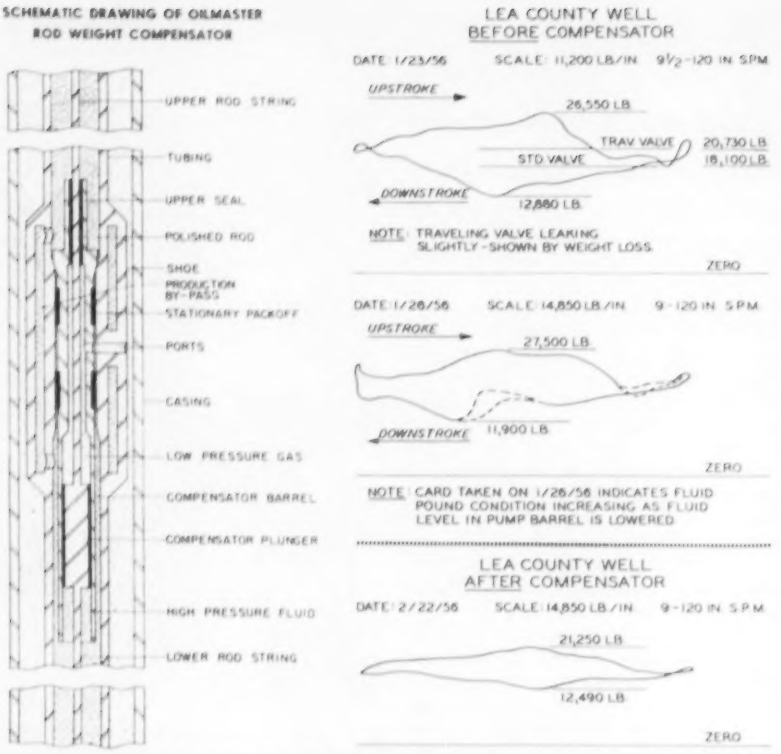
WORN valves on gas-engine compressors can be salvaged at nominal cost and made to perform like new.

The simple procedure requires the building up of the power-end intake-valve seat with stainless-steel welding metal and then machining the seat down to the correct fit.

The seat may be built up with the use of 25-20 welding rod.

By using this method the valves are made as serviceable as new ones and are sometimes superior.

Method suggested by Clyde C. Kelley, machinist, Humble Oil & Refining Co., Katy, Tex.



LOAD TRANSFER from the rods to the tubing string occurs by means of a piston device, Fig. 1 left, which uses pressure drop from fluid to gas to lift the lower rods. The effect is to decrease the polished-rod load as shown by dynamometer cards, Fig. 2, at right.

Rod-weight compensator proves to be a

Big Lift for Deep-Well Pumping

by Ed McGhee
District Editor

THE first rod-weight compensators went into commercial field use more than 2 years ago. This time is enough to judge if they are of any help in pumping deep wells. And, generally, the operators using compensators say that the devices are profitable in wells pumping from below 8,000 ft. The compensators make it possible to lower the pump, install a larger pump at the same depth, or avoid the use of high-strength rods. At the same time, the devices are paying for themselves by preventing many pulling jobs. The number of deep pumping wells is increasing daily; many of them could profitably be fitted with rod-weight compensators.

One of the latest devices intended to help lift oil from extreme depths is the rod-weight compensator. Simply stated, the purpose of this device is to transfer part of the load on the sucker-rod string over to the tubing string. This is done by using the difference in pressure between the inside of the tubing and the casing-tubing annulus to help lift the rod load.

The value of the compensator lies in keeping down the stress in sucker rods. The higher the rod stress, the more rod failures. And failures cost money in lost production, equipment replacement cost, and labor for pulling the well. The operator using a compensator can prolong the rod life by cutting down rod stress. Or else, he can lower the pump in his well without increasing rod stress. He can also increase the size of his pump to handle more fluid from the same depth and not raise rod stress.

Field experience with the rod-weight compensator show it to be reliable, trouble-free in operation, relatively inexpensive, and likely to pay out quickly when used correctly.

Gives a lift . . . Fig. 1 is a simplified cross-section of the compensator. Notice that tubing pressure puts an upward thrust on the bottom of the compensator plunger and that casing pressure puts a downward thrust on the top. The resulting force is upward since tubing pressure is much greater than casing pressure. And this "lift" from the compensator takes part of the load off the rods above. This isn't getting "something for nothing;" the load taken off the rods is passed onto the tubing, but the tubing is better able to bear that load.

The compensator must be placed in the rod string high enough that weight of the rods below it offsets the lifting force. Without this offsetting rod weight below, the string above would be thrown into compression and fail prematurely.

On the other hand, the compensator gives more lift as it is run deeper since tubing pressure increases with depth. For that reason, the compensator is run as deep as possible without throwing the rods into compression. In order to place the device correctly, each well must be checked individually considering gravity of the well fluid, size of the rods, and impulse loading on them.

Results in the Field

Rod-weight compensators have been in commercial field use for more than 2 years. Here are some representative experiences of oil operators who have tried them.

One of the first installations of the compensator in West Texas was made by a major company in May 1954. The pump in this well was lowered to 10,512 ft. when the device was installed. Prior to this, there had been frequent rod failures. Since that time, there has been only one rod failure, this coming in January 1956—some 20 months after the compensator was first run.

The only maintenance on the compensator was to replace the packing. This was replaced cheaply since it was done at the same time that the pump was pulled for repair. This company is well pleased with the compensator's performance and expects to use it in other deep-lift wells.

In Martin County . . . A second major operator tried a compensator on a trial

PRODUCING

basis in a well in Martin County, West Texas. Results with it were compared to an offset well that did not have a compensator. This comparison was convincing.

The wells were completed in a two-well reservoir and both went on the pump at the same time. The rod strings and pumps were identical except that one had the compensator. In February 1955, the compensator was run to 6,120 ft. and the pump at 10,397. The offset well without compensator had its pump at 10,492 ft.

Both these wells are pumped with air-balanced units. The unit with the compressor carries only 150 psi. of air pressure for smooth operation, while the unit without requires some 300 psi. The engines on the units are actually undersized according to company engineers. However, the engine on the well with the compensator does not labor as does the one without the compensator.

When a dynamometer test was run on the two wells, the one with the compensator showed 5,500 lb. less maximum polished-rod load than the other.

In Sweetie Peck . . . When the above trial installation proved satisfactory, this same company installed a compensator in a problem well in Sweetie Peck field of Midland County, Texas. Although this well had a long-stroke (20-ft.) pumping unit, there was an average of three rod breaks per month with the pump at 8,990 ft. So, the company pulled the tubing and rods and installed a compensator at 5,382 ft.; the pump remained at the same depth. The well began pumping again on May 20, 1955. Since that time, there have been only two rod jobs on the well. In neither case were the rods actually broken, but merely unscrewed. It's uncertain that the compensator had anything to do with the unscrewing, but there has not been such a problem elsewhere.

The pump in this well is 1¾-in. bore. Ordinarily, this company figures 8,990 ft. too deep for such a large pump, but the compensator has reduced the rod load enough to make the pump practical. The 1¾-in. pump handles all the fluid coming into the hole, but production is still not equal to top allowable for the field.

In Crane County . . . On the strength of the compensator's success in the Martin County and Sweetie Peck installations, this operator made a third installation in a well in an Ellenburger field of Crane County. The compensator is set at 6,083 ft. and there is a 2½ by 11½-in. pump set at 10,649 ft. It would be, company engineers say, impossible to use this large pump so deep without the compensator. An offset well with a 2½ by 1¼-in. pump requires a long-stroke hydraulic pumping unit.

All three of the rod-weight compensators paid out quickly for this operator and plans are to install others as the need arises.

In Lea County, New Mexico . . . A third operator installed a compensator in a well in Gladiola field north of Tatum, Lea County, New Mexico. Installation was on July 26, 1954, with the compensator at 5,015 ft. and the pump at 9,666 ft.

Before the compensator was set, the well had to be pulled three times in 6 months for rod trouble. This was despite the fact that the well was pumped by an air-balanced unit and the pump was only 1¼-in. bore.

After the compensator was installed, the maximum polished-rod load was reduced about the amount calculated. Moreover, the air-balanced unit has been changed for a conventional unit and the pump changed for one of 1½-in. bore. There has been only one rod job, it coming in December 1954.

Only maintenance on this compensator was replacing the barrel; this was done when the well was pulled to repair the pump.

A recent job by this same operator was in a well in Denton (Wolfcamp) field also of Lea County. Before the compensator was installed January 31, 1956, there had been eight rod jobs in the previous 12 months.

A compensator was set at 5,183 ft. above a 1½-in. pump at 9,200 ft. Since that time there have been no rod jobs at all. Fig. 2 shows the dynamometer cards before and after the compensator was installed. Notice that the maximum polished-rod load was reduced about 5,000 lb. This reduction brought the maximum rod stress back from 35,000 psi. down below 32,000 psi. which this company considers the maximum practical for these rods.

To depletion . . . Another West Texas operator installed its first rod-weight compensator in Wemac (Wolfcamp) field of Andrews County, Texas. The actual reduction in polished-rod load was about that calculated and was enough to permit use of a 2-in. bore pump at 8,800 ft. The installation was made on the well at the time it first went on the pump so that no comparison can be made with previous operation. Although operation was trouble-free, the well had to be abandoned shortly after installation for lack of oil production.

Therefore, compensator, rods, and pump were moved to a well in South Tokio (Wolfcamp) field. Originally, the pump was set at 8,800 ft.; but when the fluid level fell, the pump was lowered to 9,900 ft. The compensator was set at 5,600 ft.

For the first year of operation in South Tokio, there were no rod breaks in the well with the compensator. However, since then there have been three. Probably these failures are partly due to the corrosion pits that developed on the rods during their service at Wemac field. Moreover, the well pounds fluid sometimes, throwing a higher stress onto the rod string.

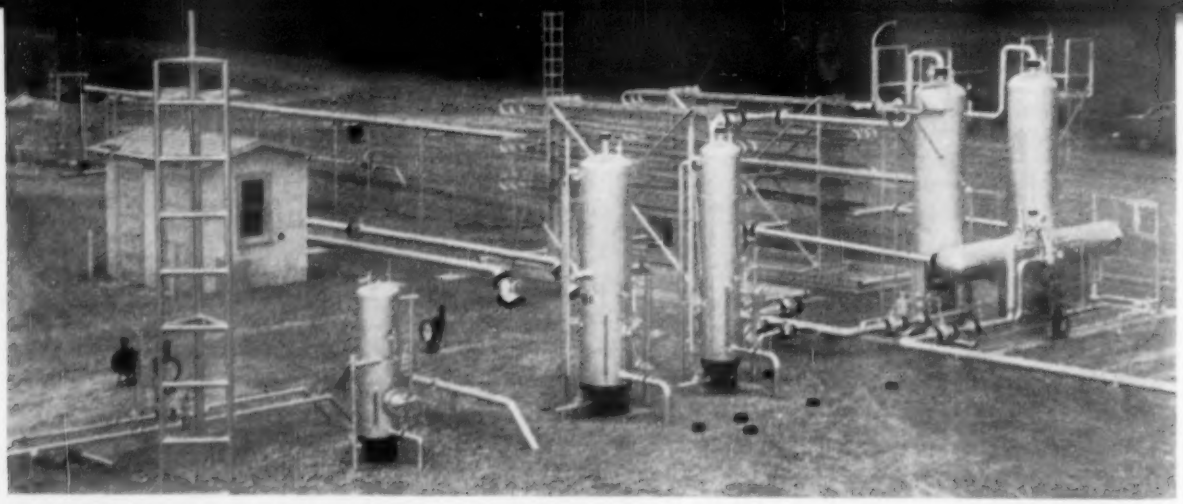
This operator believes that the rod-weight compensator has a quick payout on many deep pumping wells. Since these first installations several more have been installed in the Permian basin area.

With tapered rod strings . . . The operators are running the compensators in tapered rod strings. Above the compensator the rods are 1-in., ⅞-in., and ¾-in.; below they are ⅞-in., and ¾-in. Part of the reduction in polished-rod load is due to the fewer 1-in. rods needed; but most of the reduction is from the lift of compensator itself.

Operators caution that the compensator is a special-purpose tool that does only what it is designed to do. It will not cut down the horsepower of the engine needed on the pumping unit. It is not a cure-all that solves any and all pumping-well problems. But is is an effective device for pumping from below 8,000 or 9,000 ft. It will sometimes pump deep wells with smaller units provided the torque capacity of the unit's speed reducer is great enough. This is because the compensator cuts down on the polished-rod load and the counterbalance weight.

Actually, the compensator acts like a down-hole counterbalance. If the well flows off, the tubing pressure goes down and the compensator "lift" is less. Thus, the decrease in fluid load makes up for an increase in rod-weight load and the unit remains in balance.

Running is easy . . . To install the compensator in a well, the tubing must be pulled to the point where the compensator shoe goes. Then the pump is run in on the rods and seated. With this distance between compensator and pump measured, pony rods can be put in to get an exact spacing on the rod string. The remainder of the tubing is run and then, the remainder of the rods. The upper section of rods joins onto a hook atop the lower section of rods. Whenever the well is pulled, later, there is no need to respace the rods.



ADSORBING EQUIPMENT is in the background above. At the extreme left is the heater. In the center are the heat exchangers. The two vertical towers at the extreme right are the adsorbers. Horizontal vessels near the adsorption towers are gas separator and liquid accumulator. Fig. 1.

New type of dry-desiccant adsorber performs well in

Removing Water, Hydrocarbons Cheaply

Operator was faced with dehydrating gas before it could be sold. Moreover, the gas contained some natural gasoline but not enough to pay for a gasoline plant or low-temperature separation units. Solution was a central dry-desiccant adsorber of new design which removes both water and hydrocarbons.

by E. L. Seale

WHEN it began to evaluate its holdings in Tabasco field of Hidalgo County, Texas, Houston Oil Co. could foresee production of some 25 M.M.c.f. of gas per day. Water content of the gas was high enough that it would have to be dehydrated before sale. Also, from wells already completed, it appeared that the average gasoline content of the gas would be about 0.145 gal. per M.M.c.f. of pentanes plus.

These conditions posed a problem in gas treament for Houston Oil. Conventional dehydrators would take care of dehydration simply enough, but they would leave the hydrocarbon content unrecovered. On the other hand, there was not enough hydrocarbon content to pay out a small gasoline plant. And the wells seemed unlikely to hold their flowing pressures long enough for low-temperature separation units to be effective. Houston Oil looked forward to the time when the gas would have to be compressed before sale; hydrocarbon-recovery equipment would have to keep its utility then, too.

After checking initial cost, upkeep, and recovery of various systems, Houston Oil decided to install a new design of dry-desiccant absorber. It is a large-scale model of the wellhead adsorbers pioneered by United Gas Co. and the first of its kind designed to recover such large quantities of hydrocarbons. The unit was fabricated by Parkersburg Rig & Reel Co. and commenced operation in January 1956. Its installed cost was only about 80 per cent of that for a conventional dehydrator. The unit is pictured in Fig. 1.

Four vessels skid-mounted . . . Houston's adsorber is fully automatic and consists of the four interconnected pressure vessels and gas-fired direct heater shown in Fig. 2. Two of the vessels are horizontal; one is a gas-liquid separator and the other a liquid accumulator. The other two vessels are vertical and are adsorption towers. Since all four vessels are mounted close together, only little piping is needed to connect them.

A three-way valve on the main gas stream and a smaller one on the regenerating gas stream are the only valves needed to switch flow from one desiccant bed to another. These valves operate pneumatically and are actuated by a time switch.

The main gas stream enters the center of the horizontal separator and any free water or hydrocarbons fall out. The gas flows to one end of the vessel, according to which adsorption tower is on stream. The free liquid gravitates into the accumulator. From the adsorption tower, the gas flows through a back-pressure valve and into the sales line.

Regenerating gas comes off the incoming main line upstream of an entrance control valve. This small volume of gas passes through the heater and into the tower on regeneration cycle. The heated gas picks up the liquid from the desiccant bed and passes out into an atmospheric fin-tube heat exchanger. There, the hot gases cool and the liquid begins to condense. From the heat exchanger, the cooled regenerating stream passes into the end of the horizontal separator away from main stream flow. (Remember that main flow enters the separator in the middle.) The liquids fall out of the regenerating stream and the remaining gas joins the main stream

(Continued on page 111)

PRODUCING

CALL BETHLEHEM FOR FLANGED-AND-DISHED HEADS – Bethlehem makes flanged-and-dished heads to meet virtually every requirement. Types furnished include ASME Code flanged-and-dished, standard, elliptical, flanged-only, dished-only, shallow-dished, tank-car, obround and double-dished. Diameters: up to 144 in.; thicknesses: 14 gage to 3½ in. Bethlehem also produces standard manhole and handhole saddles, covers and fittings. We also furnish heads with flued openings. If you would like to have complete information about the Flanged and Dished Heads that are manufactured by Bethlehem just write or phone the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Why Mission Pistons and Mission Liners Last Longer When Used Together

Nothing but the finest will bear the name of MISSION MANUFACTURING CO.

Both of the dimensions being checked below are vital because *both* affect the clearance between piston flange and liner bore. Too much clearance means short life for piston rubbers and liners.

Mission Pistons and Mission Liners last longer when used together because they fit closely and wear slowly. We have taken extra care with both to postpone the day when clearance becomes excessive. Here are some of the things we do:

We machine piston flanges to extra close tolerances to keep initial clearance low. Then we provide a wear groove so you can tell when to change the piston body.

We induction harden the flange to reduce the rate of piston wear. Finally, we apply a special treatment to the flange to prevent galling.

We machine Mission Liners to extremely close tolerances. Then we give the fine alloy steel a precision induction hardening treatment that results in a hard, uniform, wear-resistant bore.

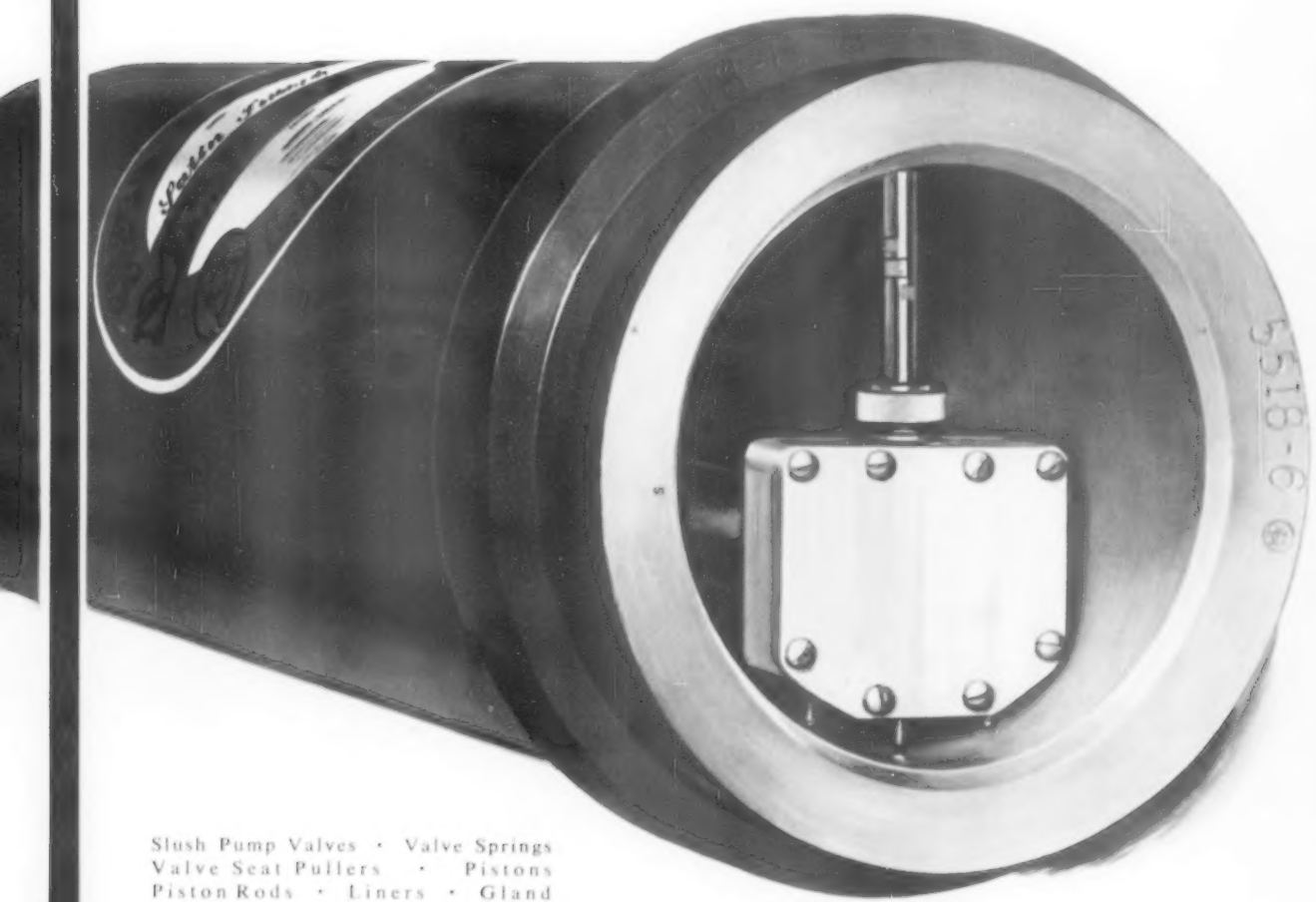
Finally, we "Satin Finish" the bore to further increase liner life.

To get *all* the life built into Mission Pistons and Mission Liners, however, they must be used together.

Mission Pistons, for example, will give outstanding service in any make of liner — but an oversize or excessively worn liner will shorten piston rubber life.

Both Mission Pistons and Mission Liners are guaranteed to give satisfactory service or your money will be refunded. Order them both from your supply store. You can't match the service you get when you use them *together*.

MISSION MANUFACTURING CO. • P. O. Box 4209 • Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • 17 Hanover Square • London, W. 1, England • Cable Address—"Missoman"



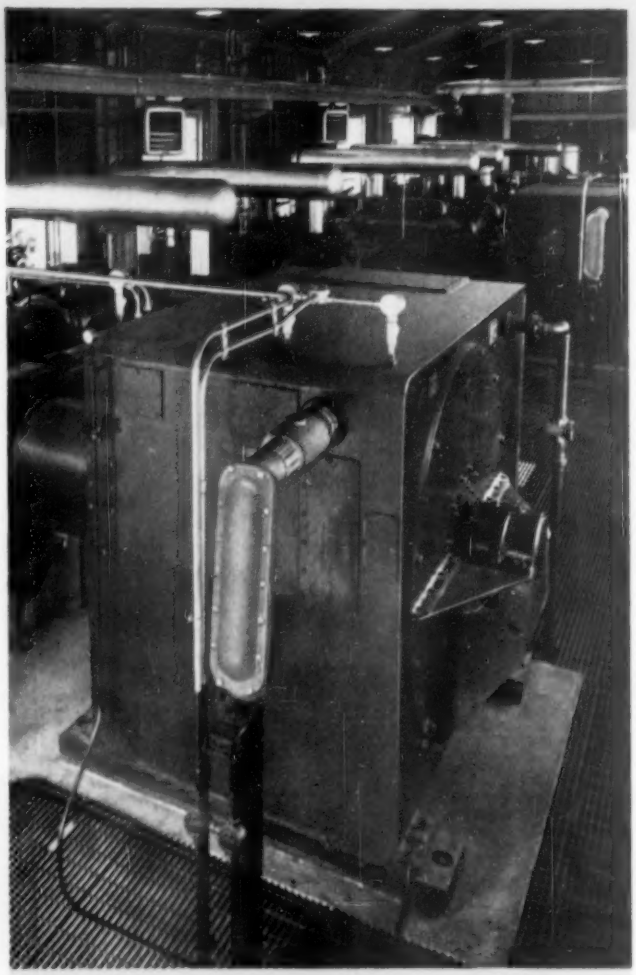
Slush Pump Valves · Valve Springs
Valve Seat Pullers · Pistons
Piston Rods · Liners · Gland
Packings · Slips · Swabs
Centrifugal Pumps · Plug Valves

ELLIOTT inert-gas-cooled motors solve refinery safety problem

Shown here are three Elliott 1000-hp, inert-gas-cooled motors driving reciprocating compressors which serve a catalytic reforming unit having a rating of 10,000 barrels per stream day.

Normally, motors for use within battery limits of light hydrocarbon processing units are of explosion-proof type. Because of the large size required, these inert-gas-filled (water cooled) totally-enclosed motors were chosen as safest and most economical for the application. Their satisfactory operation is evidence of the correctness of this choice.

The broad experience of Elliott engineers is available to help you select electrical equipment for either new or modernized installations. Inquire of our nearest District Office, or write Elliott Company, Ridgway Division, Ridgway, Pa.



Compressor room, showing three 1000-hp, 394-rpm, 2300-volt Elliott motors. They are of the "totally-enclosed, water-cooled" type, with inert gas instead of ambient air circulating over a tubular heat exchanger. The inert gas is introduced at a slight pressure of 0.15 psig. to maintain a positive pressure on the motor at all times.

RG-23

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS
DEAERATING HEATERS • EJECTORS • CONDENSERS
CENTRIFUGAL COMPRESSORS • TURBOCHARGERS
TUBE CLEANERS • STRAINERS

in the middle of the vessel. The combined streams then flow into the tower on adsorption cycle.

For simplicity of flow, there are two of the heat exchangers, one for each of the adsorption towers.

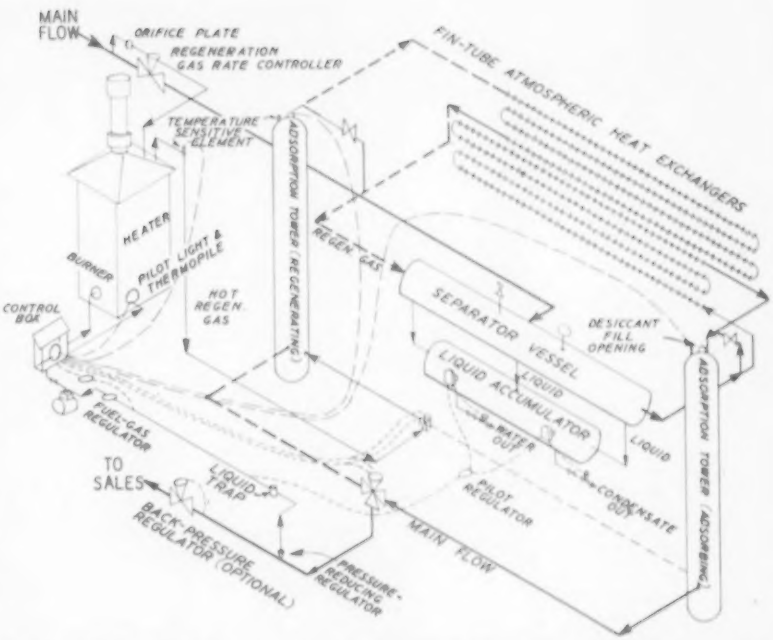
Lease gathering . . . In original planning of gas dehydrating, Houston Oil considered installing low-temperature units and storage tanks at each well. However, the gathering system with central treating and storage proved to be the cheaper route. Besides, the wells showed signs of losing flowing pressure before low-temperature units could pay out. (This has proved to be the case; in some cases flowing pressures have declined since the wells were opened to production.)

Each well in Houston Oil's Tabasco system has its own separator. Two lines, one for gas, one for condensate, carry production to the central storage and treating point. Two lines should reduce possible corrosion problems. About 600 bbl. per day of condensate moves to storage from the well separators.

The gathering lines were designed to operate at 1,500 psi. gas pressure. This is enough to allow a drop of 600 psi. for cooling the gas to 80° F. at the adsorbers. However, it is not enough drop (calculated to be 1,200 psi.) to form hydrates. Throttling the gas for cooling is desirable since each 20° rise in inlet temperature cuts the unit's capacity roughly in half.

To catch 25.75 bbl. . . . The dehydrating unit holds 3,600 lb. of desiccant—1,800 lb. in each of the two towers. This is only about one-fourth as much as conventional dehydrators of the same capacity. Each 100 lb. of the desiccant has the capacity to adsorb about 3 gal. of fluid at 80° F. On a 72-minute cycle of adsorption and regeneration, the unit should yield about 25.75 bbl. per day of total fluid.

Rocks in towers . . . Design capacity



GAS-DRYING SYSTEM centers about two towers filled with dry desiccant. Alternately, one is adsorbing while the other is being regenerated with heated gas. After being cooled, regeneration gas merges with main wet-gas stream in separator. Fig. 2.

of the unit is 25 M.M.c.f. of gas per day at 1,000 psi., but when it was first put on stream, only 18 M.M.c.f. was being produced. The unit handled this volume at 800 psi. with no trouble for a month. However, when throughput was raised to 21 M.M.c.f., the pressure drop across the desiccant beds jumped. This great pressure drop was caused by the desiccant particles being broken down into smaller ones. One possible explanation for this was that slugs of liquid were coming out of the heat exchanger, and these could have disintegrated the desiccant particles. Actually, this was not the case. But to guard against such an event, a bypass was put around the heat exchanger so that the main gas stream would go directly from inlet separator to adsorption tower.

However, even then, there was too great a pressure drop across the bed at 21 M.M.c.f. flow rate. It seemed possible that the incoming gas was jetting down onto the top of the bed and that resulting turbulence could be enough to break up the desiccant particles. An improved-design entrance nozzle was tried but failed to solve the trouble.

Laboratory tests with transparent models showed one cause of the trouble. When the three-way valve on the main gas stream changed direction of flow, the rapid readjusting of pressure in the system caused a backflushing of one tower. This backflush sometimes raised the entire bed, thus crushing the desiccant particles. Check valves between the three-way valve and each tower solved this part of the trouble. Still there was more pressure drop through the beds than should be.

Experimentation showed gas flow was channeling through the towers. High flow of gas through a small portion of the bed caused enough movement of desiccant particles that some were broken down. Therefore, 1¼-in.-diameter washed rocks were put on top of each bed to a depth of 1 ft. These spread out the flow and stopped any particle movement. And the trouble stopped.

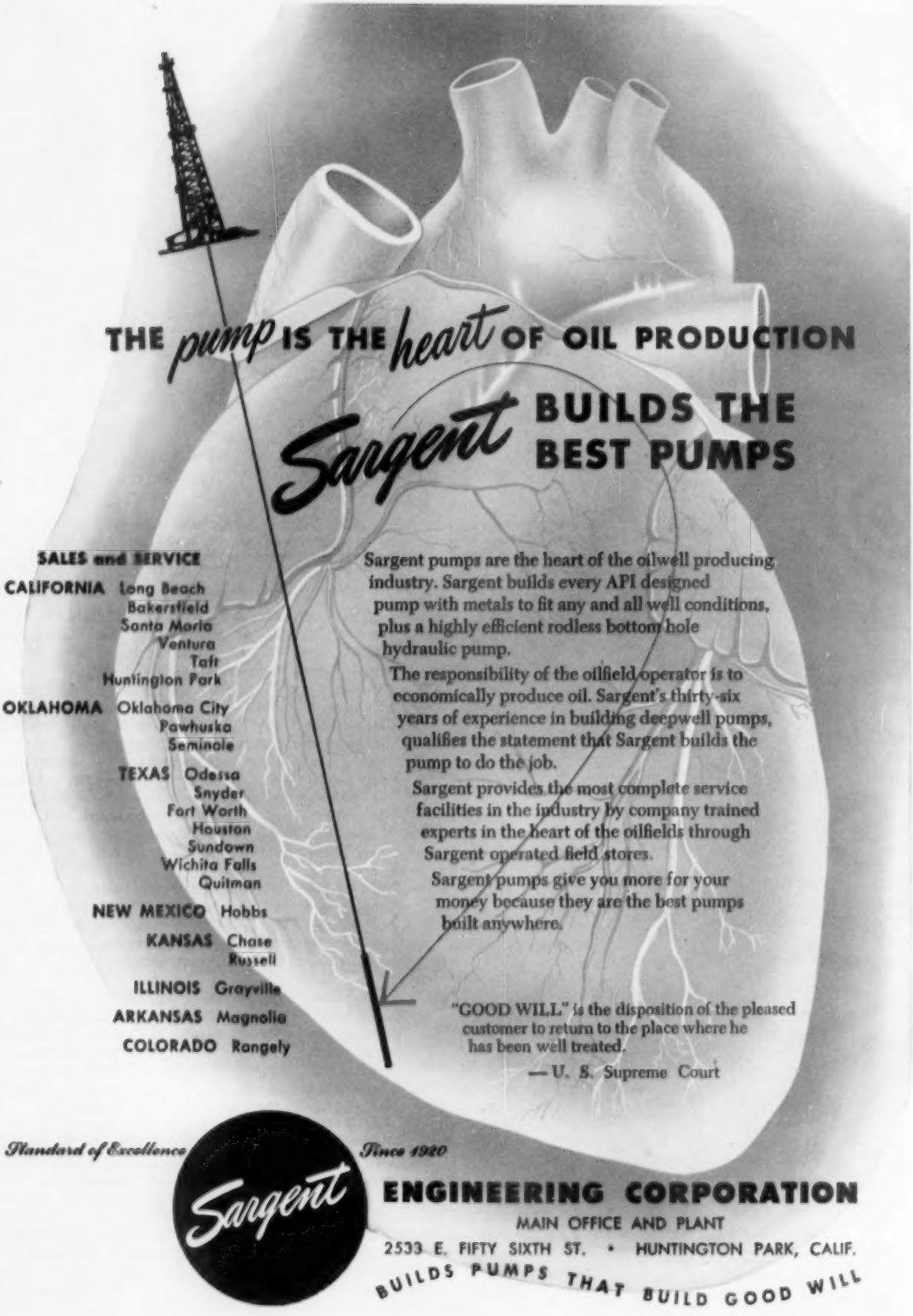
Subsequently, 23 M.M.c.f. of gas at 800 psi. was put through the unit with no excessive pressure drop. This volume is about equivalent to rated flow of 25 M.M.c.f. at 1,000 psi.

Hydrocarbon capacity . . . Recent tests showed that the unit is recovering 2 bbl. of water and 23.1 bbl. of distillate per day. The unit was designed to absorb 25.75 bbl. of total fluid per day, so operation can be called satisfactory. The adsorption-regeneration is on a 72-minute cycle.

Recently completed wells have raised the average gasoline content to 0.345 gal. per M.c.f. of pentanes plus. This fact makes it impossible for the adsorber to recover all of the hydrocarbons in the gas stream. Later on it may become profitable to install another of the adsorbers in parallel with the first to recover the remainder of these hydrocarbons.

THE AUTHOR

E. L. Seale, Jr., is sales engineer with Oil Field Sales & Service, C.A., Maracaibo, Venezuela. At the time of this report he was petroleum engineer with Houston Oil Co., Houston. Seale graduated from Texas A.&M. College in 1952 with a degree in mechanical engineering. He then joined Mene Grande Oil Co. in the Anaco area of eastern Venezuela as a junior engineer. When he left Mene Grande in 1955 to join Houston, he was zone engineer in Anaco.



THE *pump* IS THE *heart* OF OIL PRODUCTION

Sargent BUILDS THE BEST PUMPS

SALES and SERVICE

CALIFORNIA Long Beach, Bakersfield, Santa Maria, Ventura, Taft, Huntington Park

OKLAHOMA Oklahoma City, Pawhuska, Seminole

TEXAS Odessa, Snyder, Fort Worth, Houston, Sundown, Wichita Falls, Quitman

NEW MEXICO Hobbs

KANSAS Chase, Russell

ILLINOIS Grayville

ARKANSAS Magnolia

COLORADO Rangely

Sargent pumps are the heart of the oilwell producing industry. Sargent builds every API designed pump with metals to fit any and all well conditions, plus a highly efficient rodless bottom hole hydraulic pump.

The responsibility of the oilfield operator is to economically produce oil. Sargent's thirty-six years of experience in building deepwell pumps, qualifies the statement that Sargent builds the pump to do the job.

Sargent provides the most complete service facilities in the industry by company trained experts in the heart of the oilfields through Sargent operated field stores.

Sargent pumps give you more for your money because they are the best pumps built anywhere.

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.

—U. S. Supreme Court

Standard of Excellence *Since 1920*

Sargent

ENGINEERING CORPORATION

MAIN OFFICE AND PLANT

2533 E. FIFTY SIXTH ST. • HUNTINGTON PARK, CALIF.

BUILDS PUMPS THAT BUILD GOOD WILL

Dynamometer Stars in a New Role

A new use for the dynamometer is to determine net lift and bottom-hole pressure of pumping wells. The method requires only the standard valve checks and accurate knowledge of the rod string and pump. Best applied right after insertion of the pump, the method is as reliable as—but cheaper than—present sonic methods.

by Bob G. Agnew

IN the past few years, the dynamometer has become an important tool with which to view the operations of a pumping well. This tool has wide application in solving pumping troubles and in promoting efficient lifting operations. A new role of the dynamometer is to determine net lift and bottom-hole pressure—information which is often desired but seldom available.

The use of net lift and bottom-hole pressure can be a valuable aid with many advantages. With this knowledge, a better design and selection of equipment can often be accomplished, the application of equipment and production practices can be improved, and very frequently the solving of pumping problems can be made easier. This information is also quite valuable to the reservoir engineer in his efforts to obtain maximum production from a reservoir.

What's needed . . . In determining the net lift and bottom-hole pressure in a pumping well, the first thought that comes to mind is, "What equipment is necessary?" The dynamometer and its related equipment (polished-rod clamps, wrench, etc.) are the only tools required. The dynamometer test data necessary are the traveling-valve check and the standing-valve check. Although this sounds simple enough, it should be pointed out that there are several precautions which should be observed in taking these valve checks.

In taking the traveling-valve check, it is possible to get an indication of the condition of the traveling valve and the plunger without measuring accurately the weight of the rods and fluid. This test is accomplished by stopping the rods at a position just past midway on the upstroke and observing the load. As fluid passes through the traveling valve or by the plunger, this load decreases as the weight of the fluid is transferred from the rod string to the tubing string. **The load measured immediately after motion has ceased is the weight of the rods and fluid.**

If the rods are stopped suddenly, thus causing excessive vibration, error in determining this load will be introduced. To obtain the best results, the motion should be stopped at a minimum deceleration rate thus reducing the impulse to a minimum. Also, it is good practice to perform this test at least twice to insure a representative determination.

The standing-valve check is taken by stopping the rods just before the end of the downstroke. In a well that pounds fluid or is in a pumped-off condition, it is especially important that the motion be stopped near the end of the downstroke to insure that the traveling valve is open. Should fluid be leaking past the standing valve, the traveling valve will close and the load will begin to increase. **This initial load, with the traveling valve open, is the weight of the rods submerged in the well fluid.**

Here again, it is important that the motion be stopped at a minimum deceleration rate, therefore reducing the impulse to a minimum. Performing the test at least two times will again insure a representative determination.

How it's done . . . From the foregoing tests, there are two things which have been determined: (1) the measured weight of the rods and the fluid, and (2) the measured weight of the rods immersed in the well fluid. Using this information, it is a simple matter to determine the measured weight of the fluid.

The first step in determining the net lift and bottom-hole pressure is to find the average or effective gradient of the fluid in the tubing. This will be a variable factor since the tubing may be filled with a heterogeneous mixture of salt water, oil, and gas. However, by using Archimedes principle, the average gradient may be determined from the actual buoyancy of the rods.

Steel immersed in water has a buoyancy equal to the weight of the steel times the ratio of the densities of water and steel. Thus the buoyancy of a string of sucker rods immersed in water is determined by the equation:

$$B_{rw} = W_{ra} \times 0.125 \qquad (1)$$

Where:

B_{rw} = buoyancy of rods in water, lb.
W_{ra} = weight of rods in air, lb.
0.125 = ratio of density of water and steel.

The buoyancy of the rods immersed in the well fluid would be:

$$B_{rf} = W_{ra} - W_{rm} \qquad (2)$$

Where:

B_{rf} = buoyancy of rods in well fluid, lb.
W_{rm} = weight of rods measured, lb.

Using Equations 1 and 2, the average gradient of fluid in the tubing may be calculated by:

$$G = 0.434 \times B_{rf}/B_{rw} \qquad (3)$$

Where:

G = average gradient of fluid in the tubing, psi. per ft.
0.434 = gradient of water, psi. per ft.

Using this information, it is possible to determine the calculated fluid load, which assumes the annulus fluid level to be at the pump or the formation pressure to equal zero a pump depth:

Author is with Humble Oil & Refining Co., Midland, Tex. Paper presented at the 1956 West Texas Oil-Lifting Short Course, Texas Technological College, Lubbock.

$$W_{fc} = D \times G \times A_{pn} \quad (4)$$

Where:

W_{fc} = calculated fluid load, lb.
D = depth to pump, ft.
A_{pn} = net area of pump plunger, sq. ft.

The measured fluid load, which is the calculated fluid load less any assistance from formation pressure, is determined by taking the difference between the measured weight of the rods and fluid and the measured weight of the rods:

$$W_{fm} = W_{rf} - W_{rm} \quad (5)$$

Where:

W_{fm} = measured fluid load, lb.
W_{rf} = measured weight of rods and fluid, lb.

The difference between the calculated fluid load and the measured fluid load would be equal to the force applied to the system by the formation pressure. This force divided by the full area of the plunger would be the bottom-hole pressure at the pump depth.

$$B.H.P. = \frac{W_{fc} - W_{fm}}{A_p} \quad (6)$$

Where:

B.H.P. = bottom-hole pressure at the pump, psi.
A_p = full area of plunger, sq. in.

The net lift would be determined by:

$$L_n = \frac{W_{fm} \times D}{W_{fc}} \quad (7)$$

Where:

L_n = net lift, ft.

Checks out . . . The accompanying table shows a comparison of this method with sonic or bomb measurements on several wells in the West Texas area.

		Dynamometer			Sonic b.h.p.
Well	Pump depth (ft.)	G (psi. per ft.)	L_n (ft.)	B.h.p. at pump depth, psi.	at pump depth, psi.
A	4,025	.3825	3,325	268	271
B	6,000	.3310	3,040	841	*847
C	2,850	.4020	2,605	97	127
D	2,925	.4070	2,790	56	81
E	2,935	.3400	1,100	539	698

*Determined with a pressure bomb.

It should be pointed out that the net lift or apparent fluid level is not necessarily the same as the fluid level in the casing-tubing annulus. This is due to the fact that the average fluid gradient in the annulus is not necessarily the same as that in the tubing.

The liquid column in the annulus could be considerably gas-cut and thus very foamy or it could be heavily water-cut. Therefore, the determination of an average gradient for this liquid column would be impossible using surface data.

With this thought in mind, the accuracy of results obtained by sonic measurement in pumping wells is questionable due to the inadequacy of determining this average fluid gradient.

Limitations . . . The preceding method of determining apparent fluid level and bottom-hole pressure is presented as a new application for the dynamometer, and due to its limited use it has not been developed to a standard recommended practice. However, it does have sufficient merit to deserve further investigation and is presented with that thought in mind.

There are several limitations or reasons that explain the erroneous results sometimes encountered. It is essential that the exact number and size sucker rods are known. Also, the pump size, its depth, and its characteristics are equally important and should be accurately known. Excessive friction, caused by slack in the tubing, paraffin, or a pump galled with sand and scale, will introduce error. As previously stated, it is also possible to obtain a false reading when taking the valve checks due to improper technique.

From the above factors it may be seen that the best results would be obtained if a dynamometer test were taken shortly after a new or repaired pump was installed. This would reduce to a minimum the possibilities of error introduced by leaking valves, paraffin, scale, and incorrect information as to equipment installed in the well.

Should this method prove reliable, a field-wide program could be set up to take a dynamometer test each time a new or repaired pump was installed. With proper application, the information obtained from such a program would be a valuable aid in promoting better production practices and hence reducing the cost of lifting oil.

"Best results would be obtained if a dynamometer test were taken shortly after a new or repaired pump was installed. This would reduce . . . error introduced by leading valves, paraffin, scale and incorrect information as to equipment installed in the well."

. . . Further development of this method of determining bottom-hole pressure could best be accomplished by comparing the results obtained in this manner with those obtained by bomb measurement. There are a number of operators who have wells with facilities to determine pumping bottom-hole pressures by running a pressure bomb in the casing annulus. It is hoped that this article will encourage these operators to investigate further the possibilities of this method proving reliable as another tool with which to improve the efficiency of producing oil.

BOOKS

CATALYSIS, VOL. 4. Edited by Paul H. Emmett. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22. 570 pp. $12.50.

This fourth volume concerns hydrocarbon synthesis, hydrogenation, and cyclization. It provides research chemists with the most soundly conceived reference source on physical chemistry of catalysis and catalytic processing.

This volume will be of particular interest to the petroleum and coal industries. It is devoted entirely to the Fischer-Tropsch synthesis and considers such important topics as the hydrogenation of carbon monoxide and related reactions, methanation, catalytic hydrogenation of coal and tar, and catalytic cyclization and aromatization of hydrocarbons.

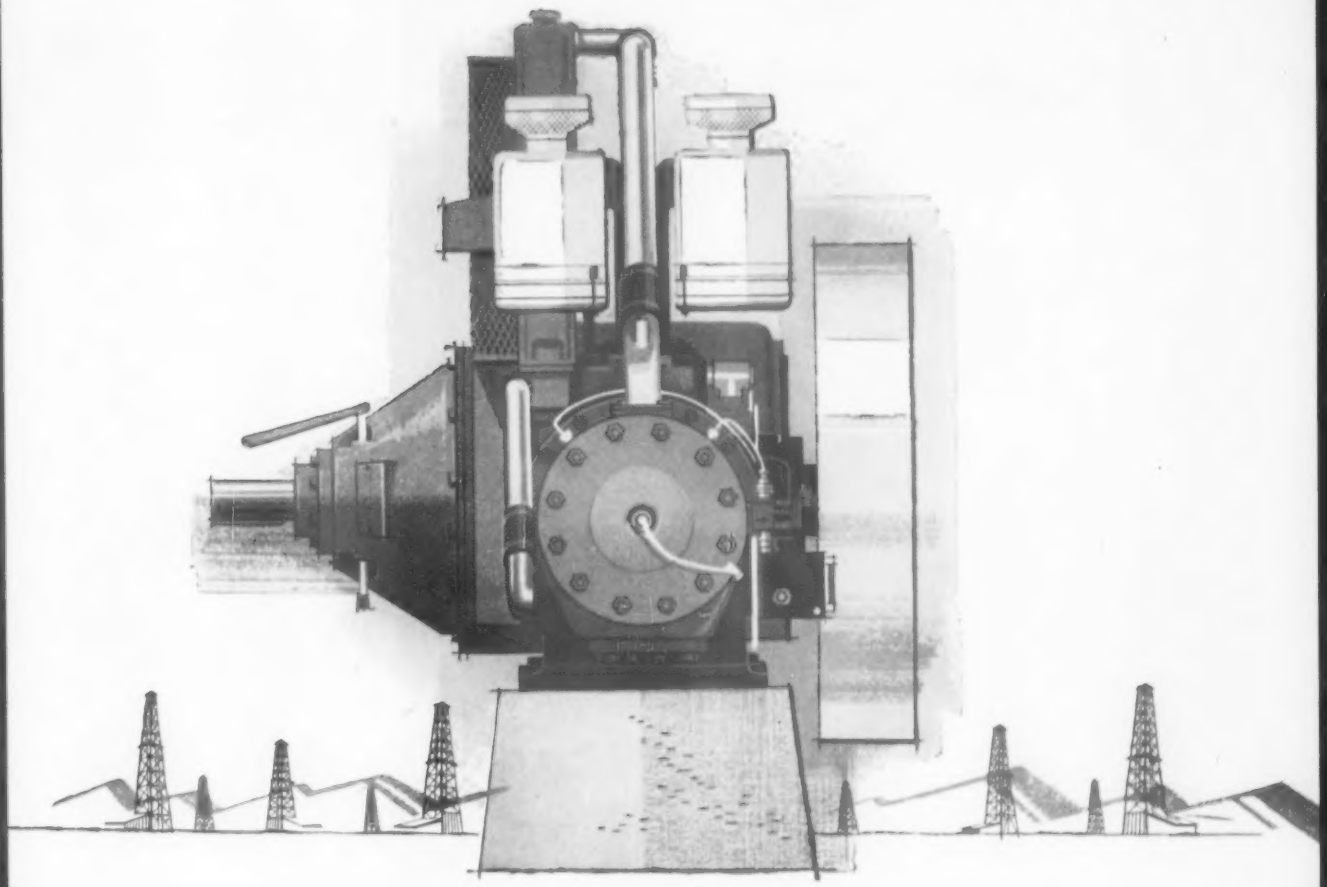
FLUIDIZATION, edited by Donald F. Othmer. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22. 230 pp. $7.

This is the first presentation in book form of the concept of fluidization and its applications in chemical engineering. It its based on a symposium sponsored by American Institute of Chemical Engineers and Polytechnic Institute of Brooklyn. Chapters deal with fluid dynamics, heat and mass transfer, graphical analysis, history and future of fluidized systems, operation of fluidization processes, fluid coking, design and control of moving solid bed systems, engineering design and operation in fluid catalytic cracking units, and application of fluidization in the chemical and many other related subjects that will be of interest to the reader.

EVALUATION OF INSULATING OILS—EUROPEAN DEVELOPMENTS. Published by A.S.T.M., 1916 Race Street, Philadelphia 3. 78 pp., $1.75.

This symposium contains research reports on testing of transformer oils in France, Sweden, and England. This is the sixth in a series of symposiums on insulating oils sponsored by a subcommittee of A.S.T.M.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.



Keeping pace with the dynamic

OIL INDUSTRY OF TODAY!

AJAX

GAS ENGINES

Since 1877

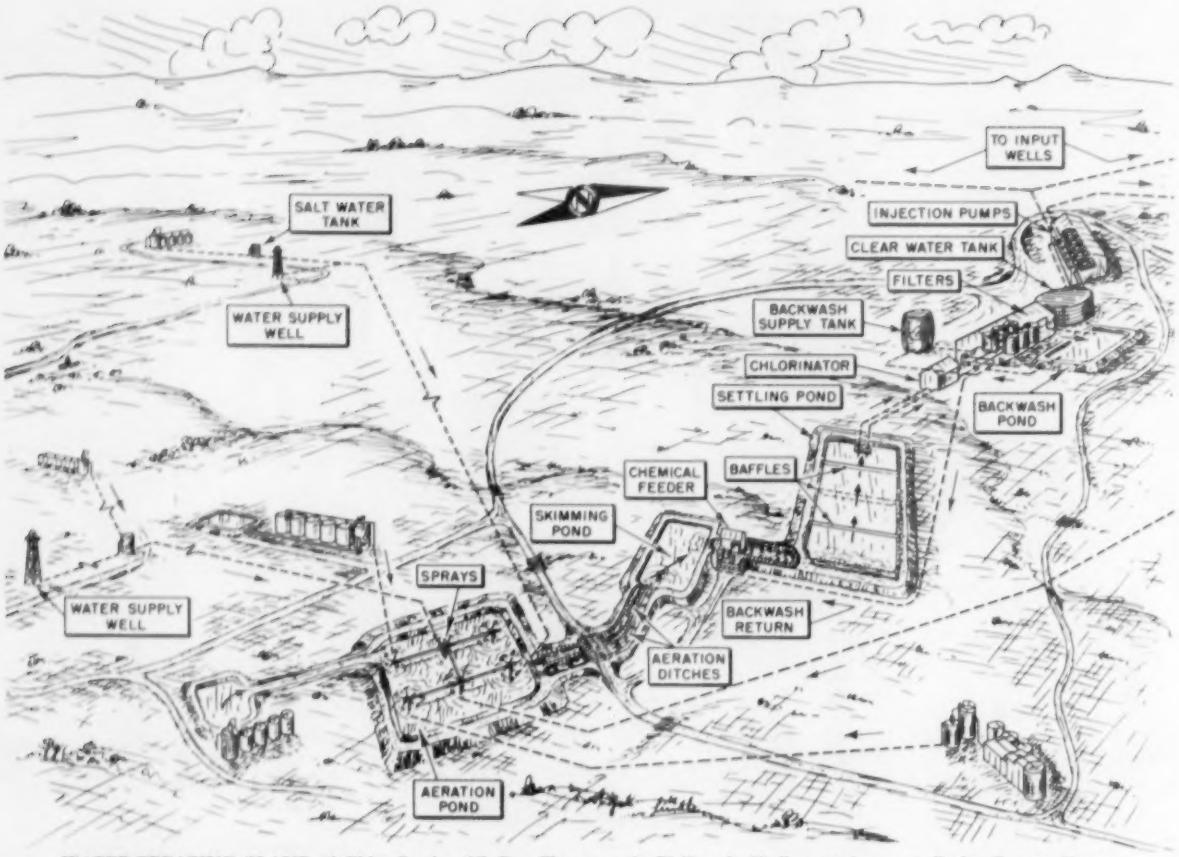
As the industry goes, so goes Ajax! This has been true decade after decade, with Ajax research and manufacture always in touch with field requirements . . . always producing prime movers and pumps a broad step ahead of accelerating performance demands. Today, with the industry's standards at their highest, Ajax' response is at its greatest. *Let your Supply Man give you the reasons.*

AJAX IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N.Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA



WATER-TREATING PLANT of Cities Service Oil Co., Chesney unit, El Dorado Shallow sand project, Butler County, Kansas.

Water Flooding in Butler and Greenwood Counties, Kansas—2

Chesney Plant Typical of El Dorado Units

by Jack P. Powell

Described here is the plant which provides flood water for the El Dorado Shallow Sand Project. An article on this flood appeared in the August 27 issue, page 94.

THE method of conditioning water at the Chesney unit is considered typical of the units in the El Dorado Shallow Sand Project. Principal source of water for the project is water produced with the oil, not only from the Shallow sand but from several deeper producing formations in El Dorado field, including the Arbuckle, Kansas City, Marmaton, Viola, and Simpson formations. A common water line supplies all of the units with produced brine from the field. Three water-supply wells, completed in the Arbuckle limestone and equipped with submersible pumps, supplement the produced water.

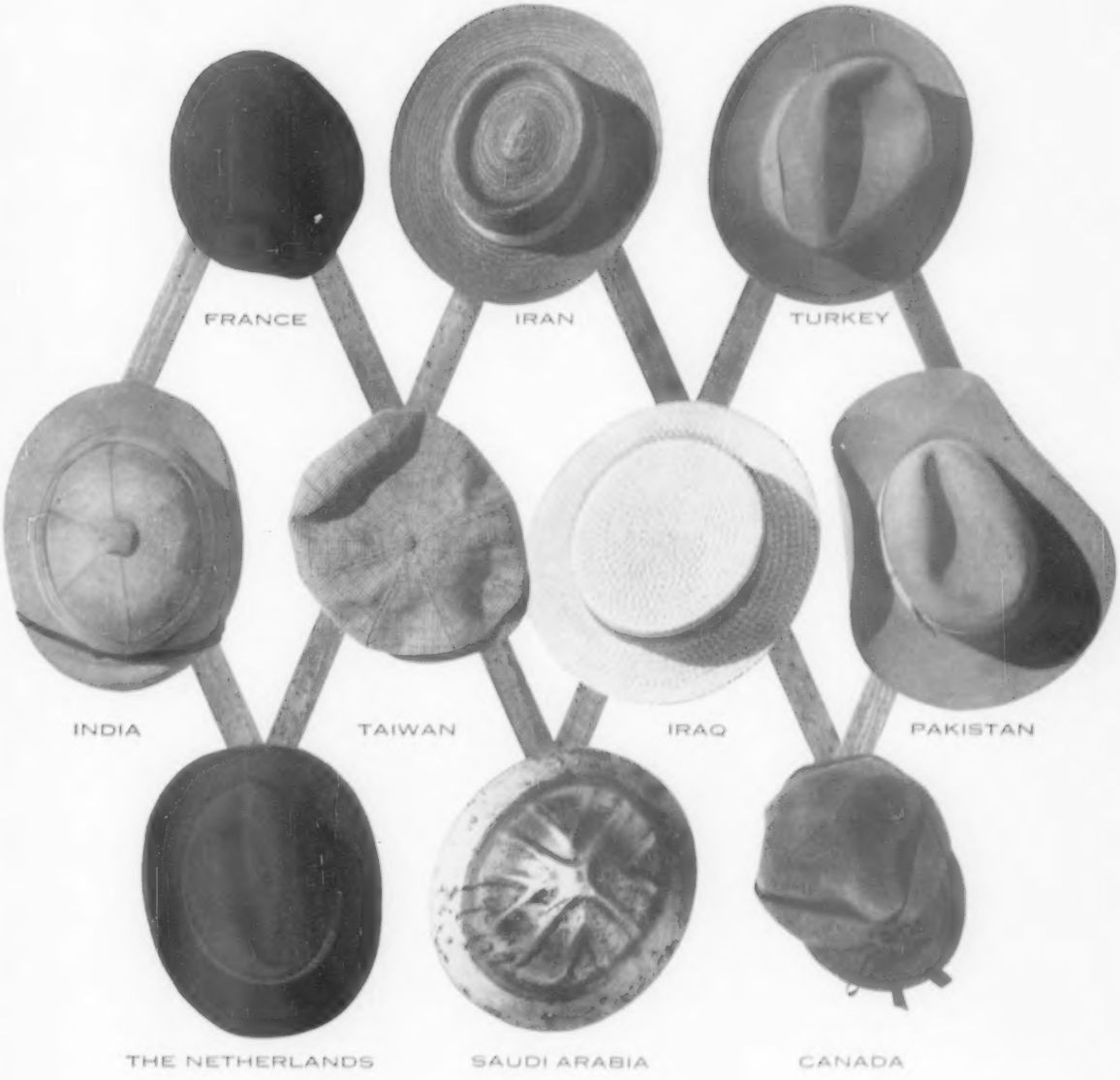
At the Chesney plant, brine from field enters the aeration pond in several ways. Produced brine from a nearby tank battery flows through an open ditch into the pond, while brine from another tank battery flows by gravity to the spray and into the aeration pond. At another tank battery the produced water from the gun barrel and from one of the Arbuckle supply wells is collected in a 1,000-bbl. wooden tank and is pumped to the sprays in the aeration pond.

Aerating water . . . In the aeration pond, approximately 120 ft. square, are six spray units for aeration of the brine. The spray arms, of 2-in. plastic pipe with 1-in. nozzles, are affixed to a 6-in. Transite header into which the brine flows from the supply wells and the tank batteries. The separate sprays can be regulated to provide enough pressure to obtain satisfactory aeration.

From the aeration pond the mixed brines flow through two aeration ditches, one of which is lined with asphalt membrane and the other with a catalytically blown hot asphalt, and into a 50 by 20-ft. earthen skimming pond. From the earthen skimming pond, which also has been treated with

Author is petroleum engineer, U. S. Bureau of Mines, Bartlesville, Okla. Data from USBM information circulat.

PRODUCING



WORLD-WIDE OPERATIONS by PARSONS

Parsons' men hang their hats in many places. Petroleum and Chemical engineers in The Netherlands, France, Canada, Turkey, Saudi Arabia... Water Development scientists and engineers in Latin America, India, Pakistan, Iraq, Iran, Taiwan... Construction crews, procurement specialists, and expediters in these and many other places—working on a wide range of projects, performing a variety of services, provide Parsons with the experience and know-how so essential in overseas operations.

THE RALPH M. PARSONS COMPANY

NEW YORK
PASADENA
WASHINGTON

ENGINEERS • CONSTRUCTORS
LOS ANGELES

ANKARA
BAGHDAD
BEIRUT
JEDDAH
KARACHI
NEW DELHI
PARIS

MINERAL ANALYSES OF FLOODING WATERS, CITIES SERVICE OIL CO., EL DORADO SHALLOW SAND PROJECT, BUTLER COUNTY, KANSAS

	Supply well		Produced brine		Mixed brine, untreated		Clear water	
Radical—	P.p.m.	Reacting values in per cent (Palmer)	P.p.m.	Reacting values in per cent (Palmer)	P.p.m.	Reacting values in per cent (Palmer)	P.p.m.	Reacting values in per cent (Palmer)
Calcium (Ca)	1,580	7.72	5,800	7.87	2,260	5.41	2,370	5.54
Magnesium (Mg)	418	3.61	1,750	3.91	1,220	5.16	1,180	4.88
Sodium (Na)	9,080	38.67	33,300	38.22	19,000	39.43	19,400	39.59
Carbonate (CO_3)	0	0	0	0	0	0	0	0
Bicarbonate (HCO_3)	232	0.37	635	0.28	537	0.42	605	0.46
Sulfate (SO_4)	2,130	4.34	174	3.62	1,820	1.82	1,760	1.71
Chloride (Cl)	16,400	45.29	64,700	49.62	35,300	47.76	36,200	47.83
Total solids	29,840	100.00	105,359	100.00	60,137	100.00	61,515	100.00
Hydrogen sulfide (H_2S)	Yes		None		None		None	
Barium (Ba)	None		None		None		None	
Specific gravity	1.023		1.077		1.045		1.044	

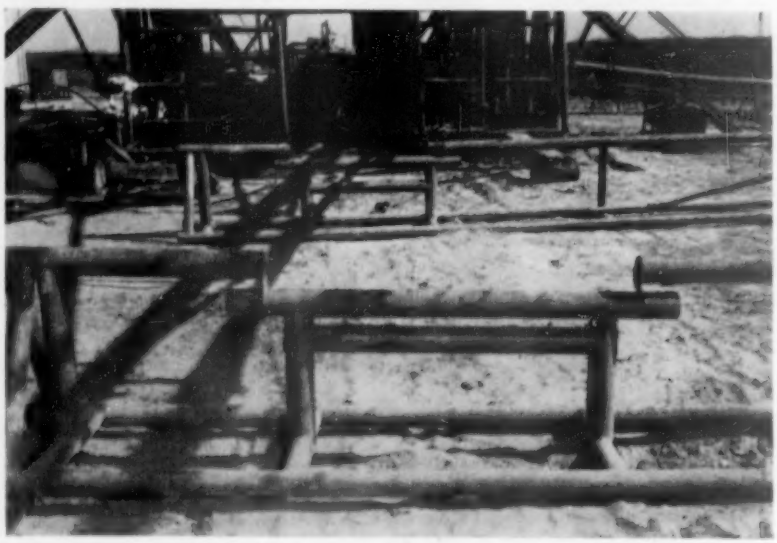
the hot asphalt to prevent seepage, the brine flows through three 8-in. pipes into a ditch lined with asphalt sheet material where a preformed chemical is added proportionally by an automatic feeder. The sealed ditch, 1.5 ft. deep by 5 ft. wide, has been provided with cement blocks to aid in mixing the chemical as the water flows into a rectangular settling pond of about 30,000-bbl. capacity.

Solids settling . . . Three baffles across the pond are arranged to cause the water to flow under the first baffle, over the second, and under the third. The retention time of the water in the pond is about 3 days at the current rate of handling (10,000 bbl. of water daily). The settling pond also is lined to prevent seepage. Two 8-in. Transite pipes, the inlet ends of which are supported by a float, conduct the water through a second chemical house where about 50 lb. of chlorine is added daily to minimize the growth of bacteria.

The treated water passes through the six filter units of the open, rapid-sand type, 8 by 8-ft. wooden tanks, each filled with graded sand and gravel. A U-shaped trough installed 1 ft. above the sand carries off the backwash water to a separate backwash pit, where sediment settles out and from which the water is returned to the skimming pond. A float control maintains a 3-ft. head of water above the filter sand, and a 6-in. collector pipe drains the filtered water into the clear-water tank. A supply of clear, treated water is kept in a separate tank for backwashing the filter.

The clear-water tank is a covered 800-bbl. wooden tank about 10 ft. high. Automatic controls actuate pumps to keep the tank full and provide a 9-ft. head to the intake of the pressure pumps. Three 8-in. pipes from the clear-water tank serve five pressure pumps, which discharge water to the distribution lines at 625 psi. The pumping plant houses six pressure pumps, five of which supply water to the Shallow sand flood. The other pump supplies water to a flood in the Marmaton formation. The pumps are powered by electric motors. The table compares the results of mineral analyses of water at various sampling points.

ON THE JOB . . . . . IN THE FIELDS



Flush walkway made with pipe rack

TO simplify their pipe racks, Clark Fuel Producing of Mission, Tex., has an offset into which the walkway fits. When the walk is placed in the rack, its level is flush with the rack. This allows drill pipe and casing to be rolled easily into place for running.

The walkway support is built right into the pipe rack. It is recessed just the depth of the walkway and is welded to the runners of the rack.

The walkway is in two sections. Three-and-a-half-inch drill pipe forms the base and planks are bolted to it. The runners on the sides of each of the sections have interlocking ends so that the walkway is solid when the sections are butted together. This type of connection is made by turning down the end of one runner and boring out the end of the other so that the two telescope together. A pin dropped through a hole in the interlocked ends fastens them together.

After the pipe racks are spotted, the two sections of walkway are fitted together and placed in the recesses. Bolting them down takes only a few moments of time. The result is a firm, smooth walkway, flush with the rack.

CONTINENTAL

Serving the Oil and Gas Industries

CONTINENTAL SUPPLY COMPANY

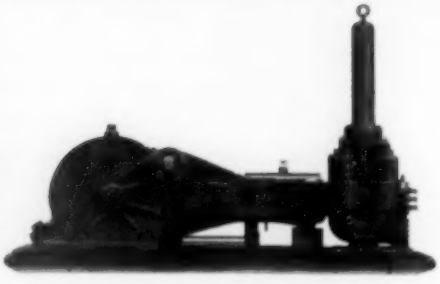
A Division of The Youngstown Sheet and Tube Company
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

The higher strength of this latest and greatest development in wire rope construction... Yellow Strand "POWERSTEEL"... is the answer to today's longer and heavier strings of drill pipe.

Yellow Strand "POWERSTEEL" is a premium wire rope. For a small additional initial investment you get much more in ton-mile service.

Your Continental man can quickly explain how "POWERSTEEL" can save you money. He can also show how even more can be saved through using the Yellow Strand Tailored Cut-off Plan.

EXPERT SERVICE... *when you need it!*



Gardner-Denver Mud Pump Service Specialists are available in any and all drilling areas.

It's an accepted fact that all mud pumps require service for best performance.

It's basic that superior service is given by men who know the equipment best.

Gardner-Denver Service Specialists are better qualified to provide this service. When you depend on their experience and ability to maintain the quality built in every Gardner-Denver Mud Pump, you are assured of a more economical operation.

CONTINENTAL

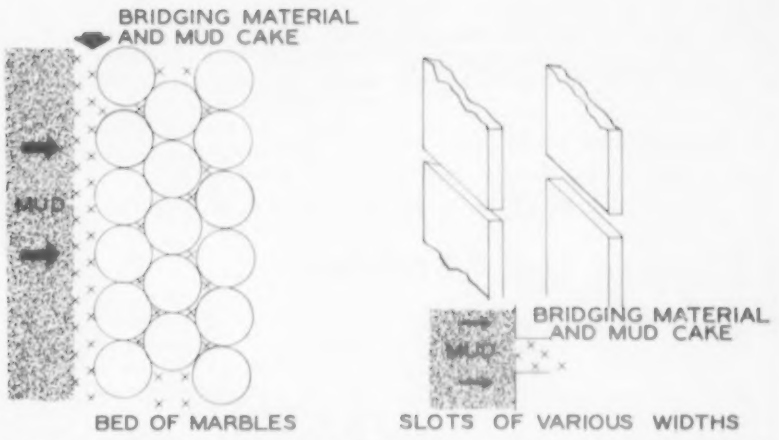
Serving the Oil and Gas Industries

CONTINENTAL SUPPLY COMPANY

A Division of The Youngstown Sheet and Tube Company

General Offices: DALLAS, TEXAS

Representatives in All Principal Oil Fields of the World



PRESENT TESTING methods may fail to simulate some cases of severe lost circulation. Fig. 1.

Gradual pressure increase helps . . .

New Methods Control Lost Circulation

Are large Particles Necessary?

Here the old explanations of lost circulation are revealed to be inadequate in some cases. Recognition of the real reasons for loss of mud can lead to better methods of stopping it.

SOME mud-loss zones in drilling wells do not appear to react to the placement of lost-circulation material as would be expected from laboratory tests in slots or beds of marbles. Probably the reason is that most loss of mud circulation in wells is to fractures that are opened, widened, and extended by pressure of the mud being lost. The fractures formed may be long wedges which may plug in other ways than that shown in laboratory equipment.

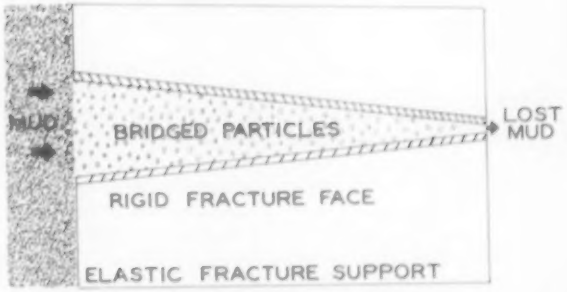
The mechanism of stopping loss of circulation to such fractures may be much like that of developing a pressure buildup in squeeze cementing. There the slurry water filters away into the formation leaving concentrated solids to bridge the fracture created by the squeeze. Utilizing this dehydrating principle may be the hopeful method of more successfully applying and developing lost-circulation materials.

Why this mechanism? . . . Many of our experiences with lost circulation indicate that it is a pressure-created occurrence. We do not expect lost circulation when drilling with gas, air, or aerated fluid. And we would not expect any serious lost circulation if we cou'd drill with clear fluids, such as water or oil, that give pressures close to formation pressures.

Normally, we do not expect lost circulation when drilling with ordinary muds that develop somewhat more pressure than that of the formation fluid. When we do encounter lost circulation with these muds the idea of existing highly permeable zones immediately comes to mind. These would be the gravel beds, reef formations, fractured limes, or fractured shales. These are the types of loss zones that the laboratory tests simulate.

However, in recent years hydraulic fracturing for production stimulation has uncovered more information about the behavior of the down-hole formations. We find that we can create flow paths where none exist. We can actually split the formation and then widen and lengthen this split. Although

DRILLING



BETTER EVALUATION of sealing material may result from testing equipment such as this. Fig. 2.

This article is based on notes from a discussion of the problem of lost circulation by T. W. Keating, of Stanolind Oil & Gas Co., Houston, before the Drilling-Fluids Study Committee of the A.P.I. Southern District.

not all of the factors involved are completely known we do know that this fracturing depends on the application of certain levels of hydraulic pressure.

Pressures Developed by Mud

A number of people have shown that pressure developed at the bottom of the hole by the mud column is responsible for lost circulation. With a certain pressure the hole will hold the mud but if that pressure is slightly exceeded, the loss may be great. Factors which affect this bottom-hole pressure are as follows:

Inherent mud density . . . Except for the particular conditions where we can drill satisfactorily with gas or air, or aerated fluid, we usually must have a drilling fluid heavy enough to restrain production from permeable zones. In some cases, however, the drilling fluid may become undesirably heavier, such

Stopping Lost Circulation . . .

MOST everyone in the oil patch takes it for granted that you can deliberately break a formation down and start losing mud into it and yet be able to get the loss stopped in 10 or 15 minutes and have it holding a pressure higher than the breakdown—if you are doing what you call a "cement squeeze job."

Maybe not so many people know that you can't expect such loss to stop nor can you expect a typical high squeeze presure buildup if the cement slurry has a low water loss.

In other words we have had right here in our hands for years a striking example of an effective mechanism of stopping lost circulation.

Now, the thing being pointed out is the mechanism—not necessarily the materials. When you get an ordinary cement squeeze pressure buildup there has seldom been time enough for the cement to set at all. Such buildup develops because the slurry water filters away from the cement solids and lets dehydrated cement solids do the bridging of the fracture.

Years ago, Halliburton carried around in a pickup truck a portable outfit that demonstrated the foregoing when they showed that a small leak in a tubing connection that was full of cement slurry under pressure would let water filter out of the slurry and rapidly accumulate a mass of dehydrated cement solids that soon choked the **full size of the tubing.** They were doing this to make it clear that you could block cement circulation in a string of pipe without having any chemical "setting" or "flash set" involved at all.

An important thing to notice right here is that the water can move through the packed cement solids quite readily. You know this also from filtration tests of cement wherein the water almost falls through in no time at all and with very low pressure gradient.

Also note that plugging the small leak of the connection is not so much. The impressive thing is the complete plugging of the whole cross-section of pipe itself. Thus there really may not be much difference between plugging a leak in a pipe with dehydrated solids and plugging a thin wedge-shaped formation fracture of growing width.

As mentioned elsewhere a very shallow experimental squeeze job was excavated and it was found that at the outer points, the cement seam was so thin you could hardly see it —but the cement seam was thicker and thicker near the little well bore and was actually over an inch thick right at the well. Note that the wedge-shaped fracture that was made reached a 1-in. width yet was plugged very effectively with only fine, 200-mesh, cement solids!

Bridging mechanism . . . Let's look at the mechanism. There are several features of importance.

1. A certain pressure has to be reached to make the fracture.

2. The fracture then immediately **opens** enough to let mud or slurry flow into it without requiring more pressure, usually less.

3. At some distance from the well bore the flow spreads out and the pressure is low enough that the fracture is not quite wide enough to let cement slurry flow, therefore cement solids begin to bridge.

4. The bridged solids let liquid filter through without much pressure drop. This allows more solids to be deposited and a **gradual** increase of pressure nearer the well bore.

5. As the pressure increases it gradually widens the fracture nearer the well.

6. The continued filtration of liquid through the earlier bridged solids lets still more solids fill the widening fracture nearer the well bore.

It can readily be visualized that if such a plugging job is done at one pressure range, and later the mud pressure goes higher (due either to mud weight or pipe surges, or choked-up circulation) this higher pressure may spring open the same fracture a little farther and immediately let a lot of the plugging material get washed away so that the whole job has to be done all over again.

Also in such a case if only parts of the plugging material are washed away and part still keeps the fracture propped open, there then may be various sizes of openings to be plugged instead of a simple thin fracture, and it may be a harder job.

On the other hand from the hydraulic fracturing information that it takes more pressure to fracture a sealed wall than one that is penetrated by liquid, it seems likely that after a fracture is propped open and plugged and coated with mud cake it may withstand considerably more pressure without being opened further.

Proposed test method . . . Some laboratory trials have been made in an apparatus attempting to simulate a fracture that could be widened gradually and differentially while being gradually plugged, but because the fracture walls were set parallel to begin with there was no tendency for any significant bridging to begin to develop at a distance from the entrance. Instead the only significant bridging was at the entrance.

Perhaps an apparatus might be devised with uniformly elastically supported, but relatively rigid walls, of a simulated "fracture," settable to start at any of various spacings for the entrance, but converging nearly to closure at the remote end. Trials could be made with fluids of various flow properties with various concentrations of various sizes (and assortments) of particles to elucidate some of the basic relations of gradually bridging, widening, and plugging a fracture in the manner of ordinary high-water-loss cement.

To carry the analogy from 200-mesh cement concentrated in 1-cp. water to a suitable size and concentration of bridging particles in 30-cp. mud, may be the hopeful approach to minimizing many expensive cases of lost circulation.

BETTER ALL AROUND

with HALLIBURTON'S

S-3

CASING CENTRALIZERS

The whole purpose of cementing can be missed if the cement is not placed uniformly and completely around the casing, with an intimate bond to both pipe and sidewall. The best . . . and most economical . . . way to provide optimum conditions is to center the casing in the hole with Halliburton's S-3 CASING CENTRALIZERS.

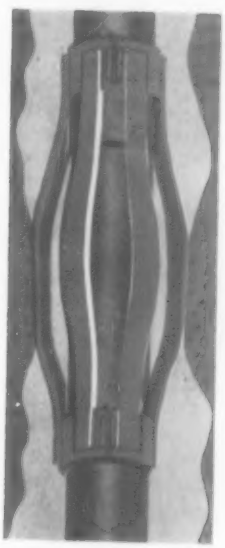
EASIER ON THE CASING

Positive centering with S-3 Casing Centralizers saves wear and tear on casing when running in the hole, greatly reduces torque on rotating casing and minimizes strains caused by running through key seats, tight hole and extreme deviation.

FREER ANNULUS CIRCULATION

Under severe torture tests, the powerful, heat-treated steel springs on the S-3 show but slight loss in bowed height after permanent set. Their dependable strength provides the positive centering necessary for free annulus circulation and a more effective, longer-lasting cementing job.

Help protect your casing from corrosion and formations from damage or deterioration by using Halliburton's Casing Centralizers to provide for a more uniform wall of cement that can maintain production longer and save on costly remedial jobs. Call your local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.



COMPLETE DATA SENT ON REQUEST
Get this valuable information for your Halliburton Service File

HALLIBURTON CEMENTING EQUIPMENT

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

"Pressure changes due to flow surges from vertical movement of pipe are distributed up and down the hole, not just below the bit."

as in drilling soft formations rapidly without enough water supply for proper dilution. Also in drilling through exposed salt, where it is undesirable to dissolve a large cavity, a saturated salt mud with a moderate accumulation of solids may become considerably heavier than necessary for formation-fluid restraint. This may contribute to serious lost circulation.

When abnormally high-pressure zones have to be drilled and the mud density must be high, lost circulation is an expected problem.

There is not much to be gained by restraining pressure at the surface on top of an otherwise too light column of mud.

. . . Cuttings. There has to be a pretty high rate of penetration in fairly large holes with only a moderate pump volume rate to get any important increase in effective density from cuttings in the rising fluid column.

For example, with 12¼-in. hole being dug at 120 ft. per hour the volume rate of cuttings is about 6 g.p.m. If the volume rate of mud is 600 g.p.m., the cuttings are about 1 per cent of the volume of the mud. If the mud going down the drill pipe is 10 lb. per gal. and the cuttings are 22 lb. per gal. (and they do not lag in the hole), the effective density of the mixture is about 10.12 lb. per gal. Doubling this rate of penetration to 240 ft. per hour and cutting the circulation rate to 300 g.p.m., there is 4 per cent by volume of cuttings, and 10.48 lb. per gal. for the mixture. If it is assumed that the cuttings come out only half as fast as the mud and that the pump is stopped as soon as the kelly is down and not started until the bit starts digging after making a connection, there could be 8 per cent by volume of cuttings and 10.96 lb. per gal. for the mixture.

. . . Mud cake. The increase of effective density from loosened wall cake might be on the same order as the foregoing. If the mud weight is already 15 lb. per gal. and to this is added 4 volume per cent of mud cake weighing 30 lb. per gal., the effective density goes up to 15.6 lb. per gal.

. . . Shale. Perhaps if, aside from bit cuttings, there are a lot of loosened shale fragments too large to circulate out and just wallowing up and down in various overgage portions of the hole, there might be increased effective densities as in Table 1 for an annular volume of 700 bbl.

That's a lot of loose shale!

Fluid friction . . . There probably are very few cases where lost circulation develops gradually as mud-flow friction requirements increase gradually. However, where upward flow pressure requirements are high due to the properties of the mud itself, it may not take very much help from one of the other factors to start lost circulation and thus the flow properties of the mud can be a very important part of the picture.

TABLE 1 — EFFECT OF SHALE ON DENSITY

Orig. mud wt, lb. per gal.	10	10	15	15
Per cent shale by volume	5	10	5	10
Barrels shale	35	70	35	70
Effective density, lb. per gal.	10.5	11.2	15.35	15.7

. . . Viscosity. Plug flow may exist with very slow motion of a thixotropic mud, but with ordinary gel strengths and hole sizes very little annular pressure drop is involved. With moderate pumping rates and ordinary hole sizes and viscosities it is likely that upward annular flow is laminar and the friction pressure drop is mainly influenced by viscosity. For such conditions in a full-gage hole the ordinary estimates of flow-pressure requirements do not seem likely to be any serious cause of breakdowns. With extremely large volume rates in ordinary size hole, however, there may be upward flow pressure requirements that contribute directly to mud loss.

Where there is turbulent flow the friction pressure drop is considerably influenced by density and not so much influenced by viscosity.

. . . Restriction by filter cake. Down-the-hole mud filter cake may be somewhat different from test-cell filter cake. There is more time, higher temperature, and undoubtedly there is accumulation of cuttings and loosened shale fragments that may come to rest and be imbedded in filter cake as it forms on permeable zones.

When lost-circulation material is in the mud, the bulk and stiffness of filter cake may be more than for clean mud.

On occasional short permeable zones filter cake may not be a serious restriction to circulation, but long stretches of filter-cake throughout thick sand sections may be serious, especially if augmented with a lot of shale fragments of unknown size.

. . . Bridging of fragments. There is considerable evidence that hard shales come loose, (and make overgage hole) as well as do soft shales. The large hard shale fragments do not soften up or disintegrate but may wallow up and down in the slow mud flow in overgage hole a long time before they ever get broken small enough to circulate out. In the meantime there can develop classified accumulations of various size fragments in various overgage hole depending on the upward mud velocities in each.

After a considerable accumulation develops, it may tend to form a mat or bridge and be carried upward all at once and then may bridge the bottleneck where the hole above is gage size. This may or may not cause extra torque at the rotary, or stick the pipe. However, it is very likely to restrict circulation, either momentarily or for more duration, and thus cause more mud pressure below, which may suddenly cause lost circulation while drilling ahead. Some of this additional pressure should show on the driller's mud-pressure gage and can be recognized if being closely observed.

. . . Balling. Balling of shale on bits and drill collars is widely referred to. Perhaps the use of these words slows down thinking toward other causes. It always seems odd that the rotational forces that can wear out steel might still permit accumulations of plastic material of much lower shear strength. "Balling" of the walls by clogging of shale fragments in filter-cake on permeable zones seems more reasonable. It can be partially remedied by "passing collars," i.e., working the drill pipe up and down a little more than the distance between tool joints, or making "short trips," i.e., pulling up into the casing and going back to bottom.

Surges by lowering pipe . . . Changes in bottom-hole pressure by raising or lowering the drill string have been investigated and reported very clearly at various times. Just a few years ago very active attention was thus directed to the loss of circulation by formation breakdown from pressure surges due to too rapid lowering of the drill string. This has helped drilling people to see that pressure changes due to changes of mud weight of one or two tenths of a pound per gallon can be completely overshadowed by pressure changes from ordinary rates of raising or lowering the drill string.

It is obvious that the flow properties of the mud greatly affect such pressure changes.

An important point is that the pressure changes due to flow surges from vertical movement of pipe are distributed up and down the hole, not just below the bit.

It is of course important also that

pressure changes from vertical movement of pipe are greatly influenced by annular space restrictions from long stretches of filter cake on thick sands.

It is also frequently significant that upward flow surges from lowering pipe may move accumulations of shale fragments upward from overgage hole in shales and cause them to bridge at gage-size hole on sands choked with filter cake.

These factors are important for running and cementing casing as well as for handling drill string. They may not only cause lost returns but also stuck pipe.

Gelation . . . Since the earliest measurements of changes of bottom-hole pressure due to movement of pipe it has been quite clear that gelation of mud greatly increases such effects.

The use of muds that develop so-called high-temperature gelation has been a very serious cause of lost circulation. There are cases where the bit and drill pipe may go to bottom with no signs of restriction or resistance but the gelled mud cannot be made to flow upward before a down-the-hole pressure is reached which fractures the formation and lets mud be pumped away continuously.

Formation-Fluid Pressure

Normal formation-fluid pressures in the Gulf Coast, and some other regions, are considered to average 0.465 psi. per foot depth, particularly at shallow depths, or about the equivalent of 9 lb. per gal. Mud of 9.6 lb. per gal., which provides a gradient of 0.5 psi. per foot depth, is usually considered safe with good equipment and alert crews. It provides a static pressure overage of 35 psi. per 1,000 ft.

However, if extremely high permeability is encountered, such as cap rock, or vugular lime, it is seldom practicable to operate with an upward flowing column that no more than balances normal formation-fluid pressure. Usually the difference between bottom-hole static pressure and bottom-hole circulating pressure is too great for a practical balance at both conditions, and either mud is lost during circulation, or the formation produces undesirable fluid into the hole when circulation ceases.

Abnormal pressure . . . There is considerable evidence that it is easier to break down formations that have subnormal or depleted fluid pressure than similar formations having normal fluid pressure.

Where there is abnormally high formation fluid pressure requiring correspondingly high mud weight, it is usually thought that the lost-circulation breakdowns occur in other exposed formations that have lesser pressures. However, there is evidence that even the formations with high fluid pressures may be broken by mud pressures that are only a little higher.

Mud Sealing Ability

There are reports that muds containing purely colloidal solids, such as the finest bentonite, may be lost in sands of relatively high permeabilities. However, muds containing ordinary clay particle sizes are not lost in even the coarsest sands at moderate pressures.

It is perhaps not widely understood that hard-clay beds and unconsolidated sands at shallow depths can be split by a rather moderate mud pressure. It has been found that the firm-clay beds into which conductor pipe is tightly driven for Texas offshore wells is rather readily ruptured vertically so that mud breaks out and comes up outside the pipe through this tightly packed surrounding formation.

Cuttings may tend to seal permeable zones and thus actually prevent or minimize lost circulation so that potential lost circulation never develops.

Lost-circulation material . . . Similarly, lost-circulation material carried regularly in the mud may avoid lost circulation that would otherwise develop. On the other hand, there are many cases where lost-circulation materials are added in such circumstances that they seriously increase the viscosity and gelation of the mud and can thus be one of the causes of prolonging lost circulation. The same is true of some worn-out lost-circulation materials. Such adverse effects should be conteracted by treatments to reduce viscosity such as water, chemicals, etc.

Possible Loss Zones

Existing high permeability . . . Gravel beds are reported to occur at moderate depths in some Gulf Coast localities. Pebbles and stones up to an inch or so in dimension, very rounded, and polished, suggest an unconsolidated and very open structure. However, lost circulation is not serious at 9.5 lb. per gal. although it may be complete at 10.5 to 11 lb. per gal. when the mud is not kept diluted by a very liberal supply of water. This suggests that the serious loss may not be due to previously existing permeability after all, but to splitting the formation by these moderate increases of pressure.

Salt-dome cap rock and Het lime in the Gulf Coast, other reef formations elsewhere, and various other limes are known from cores to have very open honeycombed structure into which lost circulation with moderate mud weights is inevitable unless very bulky materials or settable materials are suitably placed

. . . Caverns. In many of the localities where highly permeable or vugular cores have been taken there have also been reports of bits dropping into caverns. We all know about various caves and caverns explored within a few hundred feet of the surface of the ground so it seems easy to presume there may be deeper ones. However, some geologists like to tell about a granite slab bench somewhere in the eastern United States that has sagged about 6 in. in the couple of hundred years since this country was settled. If hard granite is that plastic, it is hard to imagine a cavern shut in a few million years at the overburden loads of 5,000 to 10,000 ft. of depth.

It is a lot easier to visualize a honeycomb situation that has considerable over-all structural strength but still hardly shows anything on the weight indicator or torque indicator when the bit runs into it in ordinary drilling procedure.

Frequently these so-called caverns have been thought to have rivers in them because no cement could be found after repeated spotting. In one such case the operator easily plugged the so-called cavern and the so-called river with a small batch of gunnysacks, most of which stayed in the well-bore. In this and other "cavern river" situations, it has since seemed better to consider that salt water from a nearby normal pressure formation was coming into the well bore beneath the "low-floating mud cap" and going down and then out in the high-permeability formation, which had abnormally low pressure. Such flow kept the cement from setting. You could call this a "river down the well bore" if you wanted to, but it doesn't have to have much current.

"There is considerable evidence that it is easier to break down formations that have subnormal or depleted fluid pressure than similar formations having normal fluid pressure. When there is abnormally high formation fluid pressure requiring correspondingly high mud weight, it is usually thought that the lost-circulation breakdowns occur in other exposed formations that have lesser pressures."

United Supply has put SERVICE on the map in the five states where United stores are serving oil field needs around the clock. When you need real service, be sure to call United Supply.

YOU CAN RELY ON UNITED SUPPLY!
UNITED SUPPLY
COURTESY • SERVICE • DEPENDABILITY

UNITED SUPPLY

AND *Manufacturing* COMPANY

TULSA, OKLAHOMA

Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

COURTESY • SERVICE • DEPENDABILITY

In such honeycomb situations it seems logical to spot a lightweight, settable material so as to permit the cement to stand still and set near and at the well bore.

Existing fractures . . . There may be very many situations that tie in with a bit of theory expressed by Teplitz, of Gulf Research & Development Co. 10 years or so ago. In a paper on squeeze cementing he brought in something about compressibilities of rocks. This is established information used by seismograph people as a simple matter of fact. The velocity of sound (explosion) in any material is very simply related to the density and the bulk compressibility. For a fairly average rock having an ordinary density and a sound velocity of 10,000 ft. per second the compressibility may be one part per 100,000 parts per atmosphere of change of pressure.

Thus for 10-atm. (150 psi.) change of surrounding pressure you have a volume change of 10 parts per 100,000 parts. An interesting example might be in drilling with 10-lb. per gal. mud in a region of normal formation pressures, i.e., 0.465 per foot. The 10-lb. per gal. mud will develop a bore-hole static fluid pressure 150 psi. greater than normal formation fluid pressure at a little below 2,700 ft. depth.

If the well happens to intersect only one (more or less vertical) fracture barely wide enough for a little mud to work out into it and put the extra 150 psi. into it, and if it is assumed, arbitrarily, that this 150 psi. is transmitted into each wall of the formation to a distance of only 50 ft. on each side, this adjoining rock may be compressed 10 parts in 100,000 parts or just about ⅛ in.

If that fracture had been barely open enough to get a little mud in it before, and it is now widened an additional ⅛ in., the difference in possibilities of lost circulation are impressive. If a similar assumption is made for twice the depth, 5,400 ft., the widening is ¼ in.

A few years ago there were many reports from West Texas that seldom were returns lost with 9.5 to 10.0-lb. per gal. mud (which is somewhat heavier than normal formation pressure) but that plenty of loss occurred with 10.5 to 11-lb. per gal. mud. Obviously mud was not lost just because the formation already had a very high permeability. It would have been lost at 9.5-lb. per gal. if that were the case.

Also it can be seen why nearby wells can differ. If a well does not hit just one fracture but penetrates a diversified pattern of fractures and puts the extra pressure in all these fractures, the compression of the rock is distributed throughout smaller segments and no one fracture will open very much.

It is easiest to think about the foregoing with planar fractures. However, maybe it can be applied just as well to vugular formations.

New fractures . . . Where no high pressures or high mud weights have to be considered the foregoing may not be hard to handle. However, where higher mud weights are in the picture, the possibilities of making brand-new fractures seem extremely important.

Until hydraulic fracturing for well-production stimulation became so thoroughly talked about, many people had difficulty imagining a solid rock formation being newly split by the mud pressure in a well. Naturally enough they felt there must already be high permeability where mud was lost. There used to be a lot of questions about where squeeze cement went. However, years ago a core was recovered from a sidetracked hole showing a seam of cement that came from a squeeze job in the original hole. It was at a slant.

In some squeeze-cement experiments before hydraulic fracturing was well developed, it was found:

1. In one very shallow squeeze which was subsequently excavated, the cement had gone out in a vary thin layer to about 10 ft. from the well but the fracture had been widened in a thin wedge shape to over 1 in. width at the well bore and was completely filled with the fine cement solids so as to sustain a considerably increased pressure.

2. In a squeeze at 2,500 ft. in clean sand at Sugar Valley field, Texas, which was done in a small rathole, then cored with a large core barrel, the cement was found to have gone out in a vertical fracture and also in an inclined fracture. The latter was **not** at the dip of the formations.

3. At 9,500 ft. at South Jennings field, Louisiana, a squeeze in a small rathole which was subsequently cored with a large core barrel, indicated a vertical split along the sides of the rathole and two vertical splits in the formation **below** the rathole. Each of these was filled with cement about ⅛ in. thick. The formation had been separated a total of more than ⅛ in. with a pressure equivalent to a static column of about 18-lb. per gal. mud.

In this experiment mud had earlier been pumped away steadily with a pressure equivalent to a static column of 16-lb. per gal. mud, after having developed the breakdown at about the equivalent of 17 lb. per gal.

There was no evidence of faulting in the piece of formation cored below the rathole. The fractures were near the center line.

Reports of cores containing lost-circulation material found considerably below the last point of lost circulation suggest that the lost-circulation fracture was propagated downward. Where such wedges of lost-circulation material are much thicker than any other fractures in cores from the same formation, it seems likely that the fracture was widened by the mud pressure at the time of the loss.

Similarly, high-volume, high-rate fracturing jobs undoubtedly make a relatively wide fracture. Whether these are "horizontal" or "vertical" depends on several factors.

Certain laboratory experiments have shown that where the fluid can penetrate and build up pressure in the pores of the rock a fracture can develop in, and parallel to, permeable layers. It has been said that the fracture is in a zone of weakness but maybe that is not the right way to say it. Undoubtedly the fracture develops according to the pressure distribution developed by the particular penetrating fluid at the particular supply rate.

Also laboratory work has indicated that if the wall is impermeable, or is coated with a seal such as a filter cake, then the fracture development is up and down the sides of the bore, or "vertical," as it is often called.

Also, much higher pressures are required to fracture a sealed wall than where the fluid penetrates. The ordinary mud forms such a low-permeability seal on permeable formations that the filtrate volume rate cannot build up much pressure in ordinary surrounding permeabilities. It therefore seems likely that a considerable proportion of breakdowns by mud may be "vertical" fractures in **sands** as well as in shales. Thus a "survey" of a lost-circulation "zone" may seem to be indicating a thick bed of high permeability, whereas it is a "vertical" fracture in beds whose permeability has little concern with the loss.

Effect on mud loss . . . It is generally considered that lost circulation may not develop where mud weight is increased gradually, whereas it would develop if the weight were increased rapidly. Loss started by flow surges is a related idea.

It is also found that after a formation has been broken by some intermediate mud weight, it may be plugged and then found capable of withstanding considerably higher mud weights.

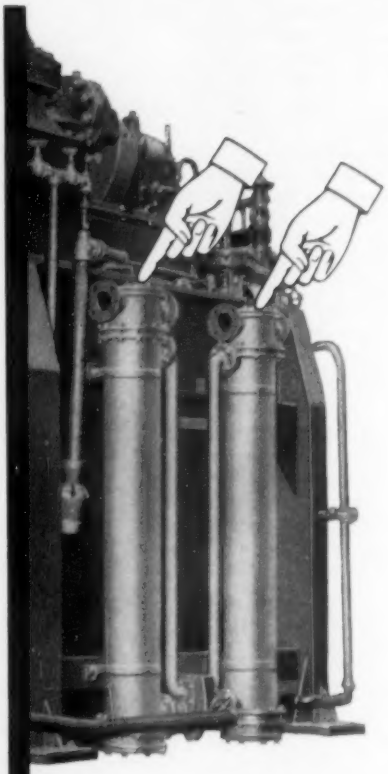
A mechanism that would seem to explain these results is that the formation break opens as a long thin wedge. When this wedge is filled and propped open with dehydrated mud solids, lost-circulation material, etc., and coated with mud cake at the well bore, it can stand higher pressure.

Ross Exchangers with I-R Compressor Trio moving 465,000,000 cu. ft. of gas per day

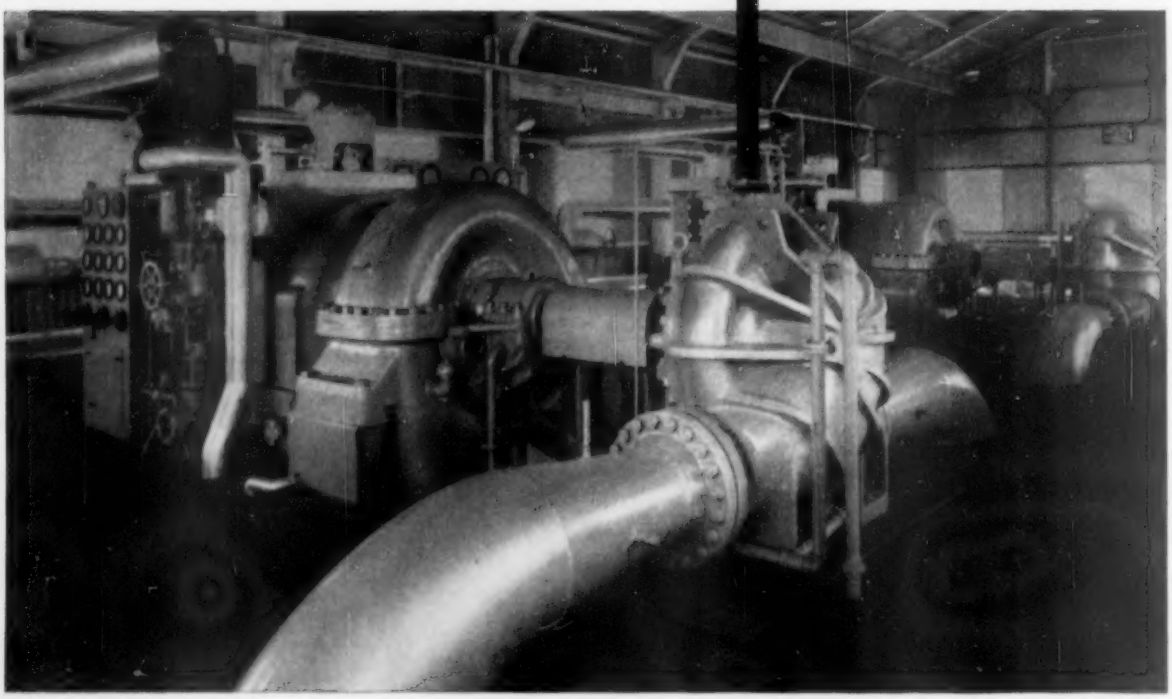
Boosting intake pressure from 470 psig to full line pressure of 800 psig, a series of three Ingersoll-Rand Steam Turbine Driven Centrifugal Compressors moves 465,000,000 cu. ft. of gas per day through this pipeline station. Because each of these I-R units is equipped with Ross Twin CP Exchangers, there are no lubrication temperature problems. Bearings and other vital turbine parts receive an ample supply of properly cooled oil at all times.

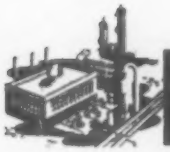
Unexcelled in thermal efficiency and ruggedness, Ross Exchangers are daily serving numerous types and makes of engines, compressors and other prime equipment on the oil and gas industry's most demanding jobs . . . under the most severe operating conditions.

Compact in design, they're pre-engineered and fully standardized in sizes to meet a wide range of oil, water, air and gas cooling requirements. For detailed information, request Bulletins 2.1K5 and 1.1K5. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.



ROSS | ROSS HEAT EXCHANGER PRODUCTS





JOB IMPROVEMENT FOR THE PROCESS FOREMAN—67

Tower Temperatures Affect Products

THE reflux has approximately the same composition as the overhead vapor. However, in descending through the tower, the reflux becomes increasingly heavier. The rising vapor strips the lighter components out of the liquid and the liquid absorbs the heavier hydrocarbons in the vapor. This interchange is very nearly on an equal volume basis because the heat balance on each tray must be satisfied. Heat is required to drive the light materials out of the reflux and this heat must be supplied by condensation of part of the vapor rising through the liquid on the bubble tray.

Of course, only the heavier fraction of the vapor is condensed in contact with the reflux. The heavy hydrocarbons become more concentrated as the reflux approaches the bottom of the tower and consequently tower temperatures are increased. Liquid from the bottom of the tower is drawn into the reboiler where further boiling off of light components occurs.

Shell and tube . . . The reboiler is usually a shell-and-tube type of heat exchanger and is located vertically along the side of the tower or horizontally set apart from the tower. Other types of reboilers which are less frequently encountered are:

1. Furnace-type reboiler such as the petro-chem heater used on the alkylation unit rerun tower.
2. Tubular-type reboiler located within the base of the tower.

The bottoms product which is substantially free of light-boiling materials is withdrawn from the bottom of the reboiler or the tower. The hot bottoms product exchanges heat with the relatively cold feed and passes through a water cooler to storage. If the bottoms product is to be redistilled, the heat-exchange equipment described above is not ordinarily used. Usually this stream is then only partially cooled to provide preheat for the subsequent distillation step.

The temperature of the boiling hydrocarbons in the reboiler determines what heating medium is used and to some extent influences what type of reboiler is selected. Some examples of this are shown:

Boiling point of bottoms product at tower pressure	Heating medium	Example
230° F. or below	Exhaust steam	Isopentane tower—G.P. No. 3
230° F. to 350° F.	Yard steam	D-6 naphtha rerun tower—Polyform unit
330° F. to 420° F.	High pressure (450 steam)	Stabilizer—Houdry unit No. 3
400° F. and above	Gas-fired heater	Alkylate rerun tower—Alkylation unit

Tower operating conditions . . . Temperatures and pressures for tower operation are determined by the required composition of the overhead and bottoms-product streams. Factors that affect the composition of these products are:

1. Boiling range of the feed stock.
2. Specifications on purity of products.

Selection of tower-operating conditions is made on the basis of the above factors.

Tower top temperature . . . The temperature on the top tray of a fractionating tower must be just high enough to vaporize completely the overhead product. Increased temperatures will cause inclusion of a portion of the bottoms product in the overhead, while lower temperatures will cause condensation of part of the overhead product and cause it to be knocked down into the bottoms product.

Pressure . . . Some hydrocarbons, such as propane and butane vaporize readily at room temperature and must, therefore, be kept under pressure to remain in liquid form. Since it is desirable to pump these products as a liquid rather than vapor, fractionating towers in light-oil service are often operated at elevated pressures. The light, easily vaporized hydrocarbons are collected as the overhead product off the column. These volatile stocks could be kept in the liquid state by reducing the tower top temperature by refrigeration. However, this method is far too expensive for general use.

The temperature of the tower top and the reflux accumulator are fixed by the temperature of the cooling water used in overhead condensing service. Therefore, the operating pressure for the tower is about the same as the vapor pressure of the overhead product at the temperature in the reflux accumulator.

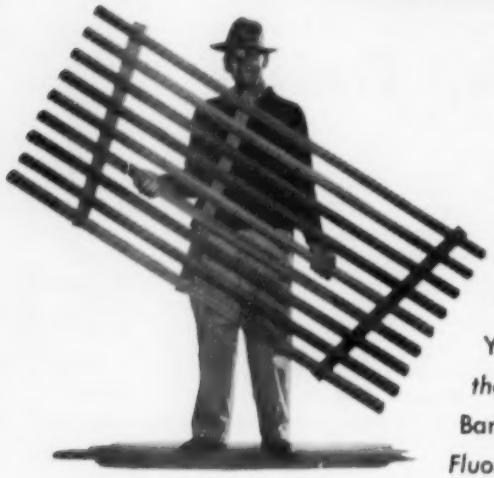
Pressures under normal cooling-water conditions are shown here for operation of various types of reboiler-type towers:

Type of operation	Overhead product	R.v.p. of overhead product	Vapor pressure of reflux drum cond. (110° F.)	Typical tower operating pressure
Depropanizer	Propane-Propylene	230	260	275
Debutanizer	BB	100	115	150
Deisobutanizer	iC_4	72	85	110
Deisopentanizer	iC_5	22	26	30

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

RE-EXAMINE YOUR COOLING TOWER'S FILLING

It Determines The Life of Your Tower!



A cooling tower's filling is in reality its heart. The design, construction and *ruggedness* of that filling largely determines the life of the tower.

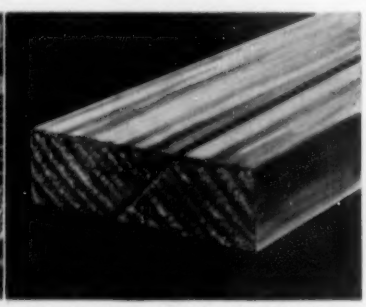
All of the members used in standard Fluor filling have a minimum thickness of one inch. *The life of this fill is several times that of the usual lath type construction!*

You get more years of dependable performance *at the lowest possible maintenance* with Fluor Sloping Bar Grid Decks — *a standard design feature on all Fluor Industrial Cooling Towers!*

Fluor uses only 100% clear all heart redwood for filling

Fluor grid decks are not only sturdily built but are made from the highest grade redwood lumber—100% clear all heart redwood—the finest cut of the log. Clear all heart redwood is free from defects and sapwood and under normal controlled water conditions will give many many years of trouble-free service. We invite you to investigate our filling before making your selection of a cooling tower.

Grid decks serve as scaffolding during erection



A 1 x 3 makes two bars for Fluor grid decks

Grid decks easily support three 200 lb. men

FLUOR PRODUCTS COMPANY

A Division of The Fluor Corporation, Ltd.

General Offices — WHITTIER, CALIFORNIA

Wood Products Mill — SANTA ROSA, CALIFORNIA

Metal Fabrication Shops — PAOLA, KANSAS

MANUFACTURERS AND FABRICATORS OF COOLING TOWERS, PULSATION DAMPENERS, MUFFLERS, PREFABRICATED PIPING AND OTHER WOOD AND METAL PRODUCTS

SALES OFFICES *and* REPRESENTATIVES IN: Birmingham, Boston, Buffalo, Chicago, Denver, Detroit, Houston, Kansas City, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh, San Francisco, Tulsa

ASSOCIATES: Fluor Corporation of Canada, Ltd., Toronto; Head-Wrightson Processes, Ltd., London, England

PAINTING STEEL—7

Which Paint System Should You Use?

by J. O. Jackson* and Joseph Bigos†

IF vaporization losses are sufficient, painting the shell plates white may be more important than painting the roof white. Generally, cone-roof tanks; variable vapor-space tanks, such as wet and dry seal lifters; and diaphragm-roof tanks are recommended to be painted white when storing volatile products. Floating-roof tanks and pontoon-roof tanks—of new construction—are usually painted aluminum, but the exterior shells may benefit by being painted white. Old tanks may have high losses and require painting both the roof and shell white.

Crude-oil storage tanks should be analyzed on an individual basis to decide the most economical and practical painting method. Often appearance and economy dictate the use of a black paint such as S.S.P.C.-Paint 102-55T, "Black Alkyd Paint." Similarly, product-storage tanks may be painted black, gray, aluminum, or in color when such appearance is desired.

Painting systems of the S.S.P.C. provide for almost any category or painting scheme the refinery is likely to require. Each paint system includes the surface preparation, pretreatment (if required), primer, intermediate and finish paints, and complete details of application including dry-film thickness per coat of paint.

A standard system resulting in good protection at low cost is included and will be provided if no alternates are specified. Aluminum paint is specified in the standard system. If a primer other than the standard, or another color or type of topcoat, is desired, then the user specifies which alternate he desires. Sufficient alternates are listed in the paint system to cover almost every desired category.

For example, in Paint System No. 1, "Oil-Base Paint Systems (for weather exposed steel)," there are over 250,000 possible combinations because of the numerous alternative surface preparations, pretreatments, number of coats, type and color of primer, and intermediate and finish paints.

In applying the paint system to refinery use, first consider the painting of tank exteriors. Paint Systems Nos. 1 and 2 would be most logical for this service. The oil-base systems in Paint System No. 1 would be the best choice for new tanks which are not blast cleaned or pickled, for repaint work by the use of hand cleaning or power-tool cleaning, and for spot repair work. This system is summarized in Table 3.

The best tank surface for painting is one free of mill scale and rust. New tanks may be descaled by blast cleaning or pickling in the fabricating shop, or weathering and blast cleaning in the field. By proper use of economical methods, field blast-cleaning costs can approximate or even be cheaper than laborious hand cleaning.

Paint System No. 2 is ideal for use over clean surfaces because the primers are quick drying and have more chemical resistance than oil-base paints. In mild environments, oil-base primers may be used over blast-cleaned steel with outstandingly good results.

Both of these systems call for three coats of paint—two primer and one aluminum finish. Two coats of primer are good insurance for protection of the surface. If white, black, gray, or a different finish is desired, the proper alternate is specified. One coat of chalking white over a dark primer will begin to show through in several years, and the tank should be repainted with white paint at that time. Four coats at the original painting will result in relatively low cost for a second coat of finish and defer repainting considerably.

The proper painting of tank bottoms has not been resolved. For noncorrosive conditions, paint is not required. Where little protection is required, asphalt varnish is applied. More severe conditions require a better coating such as a coal-tar mastic, but extremely severe conditions require hot coal-tar enamel and possibly cathodic protection.

*Pittsburgh-Des Moines Steel Co., Pittsburgh. †Senior Fellow, Mellon Institute of Industrial Research. Paper presented at A.P.I. Refinery Division meeting, Montreal, 1956.

TABLE 3—PAINT SYSTEM NO. 1, OIL-BASE PAINT SYSTEMS
(For weather exposure)

Paint System No. 1 requires good cleaning; minimum surface preparation is hand or power-tool cleaning per S.S.P.C. specifications.

Four standard heavy-duty primers are included: S.S.P.C.-Paint 1-55T (red lead-raw linseed oil); Federal Specification TT-P-86a.

Type 1 (red lead-raw and boiled linseed oils): S.S.P.C.-Paint 2-55T (75 per cent red lead/25 per cent iron oxidize-2 linseed oil/1 alkyd); S.S.P.C.-Paint 3-55T (75 per cent red lead/25 per cent iron oxide-fractionated linseed oil).

Alternate primers are: TT-P-64 lb.

Type 1 (zinc dust-zinc oxide-raw linseed oil)—good for galvanizing: S.S.P.C.-Paint 4-55T (extended red lead-linseed oil); Federal Specification TT-P-57.

Type 1 (zinc chromate-yellow iron oxide-linseed oil-alkyd): S.S.P.C.-Paint 11-55T (same as TT-57, Type 1, but red color); Federal Specification TT-P-86a.

Type 2 (extended red lead-iron oxide-linseed oil-alkyd): A.A.S.H.O.-M72-51.

Type 4 (red lead-linseed oil-alkyd).

The standard system consists of two coats of primer and a finish coat of aluminum, but numerous alternate oil, alkyd, and phenolic intermediate and finish paints are included.[1]

TABLE 4—PAINT SYSTEM NO. 2, ALKYD PAINT SYSTEMS
(For weather exposure, high humidity, and infrequent immersion)

Paint System No. 2 requires particularly good cleaning. Commercial blast cleaning or pickling is standard, due to limited wetting of primers; but alternative methods of surface preparation also may be specified.

Standard primers are: Federal Specification TT-P-86a.

Type 3 (red lead-alkyd): Federal Specification TT-P-57.

Type 2 (yellow iron oxide-zinc chromate-alkyd): Military Specification JAN-P-735 or Maritime Administration 52-MA-202 (zinc chromate-titanium dioxide-alkyd); Military Specification MIL-P-17545 or Maritime Administration 52-MA-201a (red lead-zinc chromate-extenders-alkyd).

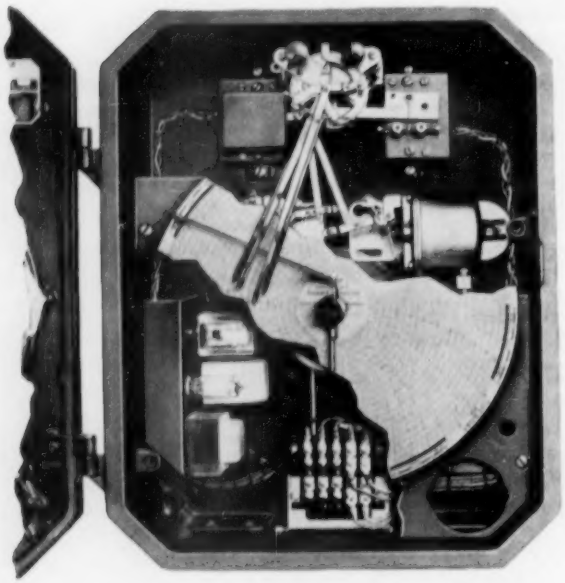
A zinc dust primer alternate (excellent for new galvanizing) is Federal Specification TT-P-64 lb.

Type 2 alkyd intermediate and finish paints are listed. They include bright colored glossy, semigloss, or lusterless finishes for equipment, machinery, trim, walls, etc.[1]

References

1. Bigos, Joseph, "Preparing Specifications for the Painting of Steel Structures," Consulting Engineer, October 1955.

NEW ELECTRONIC CONTACT CONTROLLER BY *Taylor*



FEATURES

- Changing Resistor-Capacitor Can gives Single Point or Differential Control. Control point easily adjusted by set pointer.
- Fully adjustable, self-locking differential between high and low contacts. Safe contact voltage—never over 6 volts. Current in micro-amps.
- Self-wiping control contacts made of non-corrosive Monel. All other parts are hermetically sealed against corrosion.
- Electronic tube, Relay and R-C Can are plug-in units. Load Contacts on Relay are Single-pole double-throw.
- Attachments can be fitted to present 100 Series Taylor Instruments with no drilling.
- Internal wires and external connections numbered for easy servicing. Signal lights and vibration damping available.

HERE'S rugged, positive contact action for control mechanisms of the two-position action type—the "on-offs", "open-shuts" and "high-lows". This new Taylor Electronic Contact Controller embodies a completely new concept in contact mechanisms—it's designed for:

1. Accurate and dependable operation of electrical circuits.
2. On-off applications with small process lags, slow reaction rates, and small and infrequent load changes.
3. Use on nearly all types of measuring systems—temperature, pressure, liquid level, flow, humidity, speed, etc.
4. Indicating, recording and/or controlling purposes.

An extremely versatile instrument, the new Taylor Electronic Contact Controller can be used in many different places where pneumatic facilities aren't advisable or available. It's made also for use as a supplement to pneumatic control.

These standard forms emphasize the flexibility of the instrument: Two-Position Single Point Action (On-Off), Two Position Differential-Gap Action (On-Off with adjustable differential gap or neutral zone), and Three-Position Differential Gap Action (High-Medium-Low, differential adjustable).

For full details ask your Taylor Field Engineer or write for **Bulletin 98265.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

QUESTIONS ON TECHNOLOGY

West Texas Crude Oils—Sour, Sweet, or Intermediate?

by W. L. Nelson
Technical Editor

What is the relative value of the intermediate and sweet schedule oils of West Texas? Is the reduction in price of 7 cents justified? R.P.D.

This department is unable to judge the relative merits of the more than 650 separately classified West Texas crude oils or fields. However, the purchasing or classifying of oils under the three price schedules (A sweet, D intermediate, and C sour) has long been a totally confused situation. During 1950, one purchaser from 253 fields found that his "sweet" crude purchases contained the same or even more sulfur than his "sour" crude purchases:

A.P.I. gravity	Percentage of sulfur in Sweet crudes	Intermediate	Sour crudes
36	0.49	0.54	0.325
40	0.31	0.39	0.285
44	0.195	0.235	0.225
48	0.105	0.09	0.100
Average	0.275	0.293	0.234

Nearly the same strange mixup of sulfur content appears when the entire 597 fields (1951) are examined. Of the 597 fields, 190 of them were classified during 1951 as "sweet" and 106 of them as "intermediate." The recent classification of crude oils moves at least 90 of the so-called sweet oils into the intermediate category.

If the properties of oils of the same gravity are compared, scarcely any differences are apparent—the sulfur content is the same, the percentage of gasoline is much the same (sweet oils contain less), carbon residue is about the same (sour oils are lowest), and the octane number is much the same except that the sour oils produce the highest octane gasoline.

There is one difference, however, namely, the average gravity (1951) of the oils purchased under the several schedules is different:

	Average	Range
Sweet-oil purchases	43.5	34-59
Intermediate	40	30-50
Sour	32	18-50

Thus, much of the confusion in classifying West Texas oils is the inadequacy of the 2-cent differential per degree A.P.I. that has too long been employed in stating schedules.

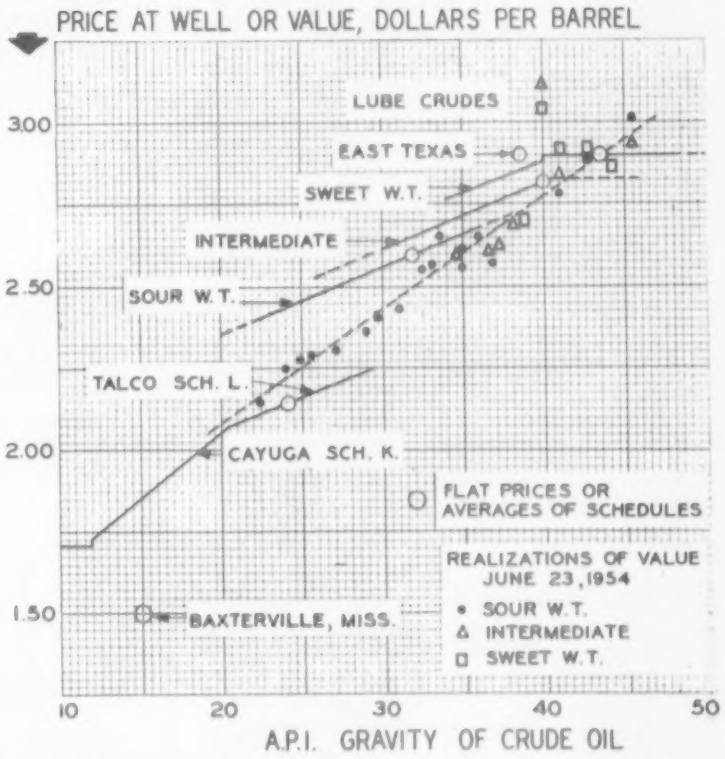


Fig. 1—Schedule prices and a few realizations (June 1954) of West Texas crude oils. (Values are now greater.)

Low-gravity oils are worth much less than high-gravity oils, and the price differential for a number of years should have been 3 to 4 cents per degree rather than 2 cents. Inflation alone would cause this difference even if the price structure of products remained the same. This inadequacy has been met by establishing numerous schedules of posted prices as indicated in Fig. 1 so that low-gravity oils can be purchased (or classified) on a low price schedule and high-gravity oils on a higher price schedule. The schedules often state the same limits to the range of gravity covered by the schedules but in fact, different gravities of oils are purchased (mainly) on each schedule.

All of the oils and schedules of oils shown in Fig. 1 contain about the same amount of sulfur when oils of the same gravity are compared, and it is quite obvious that low-gravity oils must be traded on low-

TABLE 1—AVERAGE SULFUR CONTENT OF WEST TEXAS OILS AS A FUNCTION OF GRAVITY (1951)*

A.P.I.	Schedule Sweet	Intermediate	Sour
32		0.95	1.85
36	0.50	0.58	0.55
40	0.28	0.32	0.28
44	0.19	0.19	0.19
48	0.14	0.12	

*Total of 597 fields but sulfur data on only 415 crude oils, and about half of the fields. All major fields are included.

AIR-OPERATED VALVES

The fact that the Klinger valve has no seat but is sealed by resilient packing rings which are compressed round a sliding piston, means that power is only required to move the piston from one position to another and no power is required to maintain the valve in the closed or open position. Valves are manufactured with bronze, forged or case steel bodies, screwed or flanged, with stainless steel pistons and spindles as standard, in sizes from ¼" to 6" bore. Tapped air connections are provided at each end of the air cylinder. The valves have been designed for operation with an air supply at a pressure of about 70 p.s.i., although in certain circumstances it is possible for the valves to operate at pressures down to 50 p.s.i.

Klingermatic air-operated valves are ideally suited for remote control of filling lines, emergency valves, where rapid operation is desired and such similar applications.

Write to your Klinger agent for descriptive leaflet and literature.

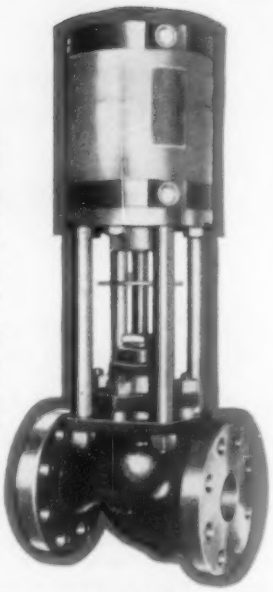


Illustration shows Klingermatic Air-operated Valves being used as remote-controlled filling and emergency valves on a gas bottling plant.

RICHARD KLINGER LIMITED, KLINGERIT WORKS, SIDCUP, KENT, ENGLAND

Cables: Klingerit **Agents throughout the world** **Telephone: Foots Cray 7777**

MANUFACTURERS OF KLINGER SEATLESS PISTON VALVES; KLINGER SLEEVE-PACKED COCKS; KLINGER LEVEL INDICATORS; RINGS AND SEALS IN KLINGER SYNTHETIC MATERIALS, AND KLINGERIT COMPRESSED ASBESTOS SHEET JOINTINGS AND PACKINGS FOR EVERY PURPOSE

Manufacturing Licensees for Canada

JOSEPH ROBB & COMPANY, LIMITED
5575, COTE ST. PAUL ROAD, MONTREAL, 20, CANADA
Telephone: WILBANK 3181 Cable: ROBCO
Branches at: SYDNEY, HALIFAX, OTTAWA, TORONTO, HAMILTON, WINNIPEG, EDMONTON, VANCOUVER, QUEBEC CITY.

Manufacturing Licensees for U.S.A.

THE KLINGER CORPORATION OF AMERICA
95, RIVER STREET, HOBOKEN, NEW JERSEY, U.S.A.
Telephone: HOBOKEN 2-7915 Cable: KLINGDALE

Distributors and Agents in principal cities.

G 19.56.G

GIVE YOURSELF A BREAK!

with **BrakeSol**

HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

Now is the time to give yourself a break with BrakeSol and clean the paraffin from your production system. Then keep it clean by setting up a program of constant treating.

FORMATION. Get more production by cleaning up the formation with BrakeSol. Use with frac jobs to get more effective results.

HEATER-TREATER. BrakeSol will allow the use of less heat, thereby increasing the gravity of your oil.

TANKS. Clean up that tank bottom by treating it back into the oil where it can be sold. Equally effective on the largest pipeline tank and the smallest stock tank.

CARMI, ILLINOIS 4-2905
CASPER, WYOMING 2-3453
GREAT BEND, KANSAS 4285
FT. MORGAN, COLO. UNderhill 7-6389
HOUSTON, TEXAS HOmestead 5-6648
LOVINGTON, NEW MEXICO 6-5954
NEW IBERIA, LOUISIANA EMerson 9-3498
ODESSA, TEXAS FE 7-7192
ARDMORE, OKLA. 6489
OKLAHOMA CITY, OKLA. VI 3-6629 WH 9-5561

CONTACT YOUR NEAREST BRAKESOL TREATING ENGINEER

Your BrakeSol Treating Engineer can show you the most effective methods of application and how to accomplish all of the above in one simple operation. Make money and save trouble this winter by the use of BrakeSol.

• **Export Distributor: The National Supply Co.**
Export Division
600 Fifth Avenue
New York, New York, U.S.A.

BRAKESOL, Inc.
P.O. Box 9506 Okla. City, Okla.

DESIGNERS and BUILDERS

1st. DEEP WATER DRILLING BARGE

The first of the "Greats", Mr. Charlie, pioneered by American Marine, designers and builders of more than half of all inshore and offshore drilling barges since 1945.

Formerly Alexander Shipyard

VA 2408
P. O. Box 8126

AMERICAN MARINE CORPORATION

New Orleans 22, La.

PIONEERS IN OFFSHORE DESIGN

TABLE 2—AVERAGE OCTANE NUMBER OF WEST TEXAS GASOLINES (1951)*

	Oct. No.	Range
Sour schedule	52	(35-65)
Intermediate schedule	42	(20-54)
Sweet schedule	50	(12-62)

*Only 72 octane numbers.

TABLE 3—GEOLOGICAL FORMATIONS FROM WHICH EACH OF THE THREE SCHEDULES OF OILS ARE PRODUCED (1951)

	Schedule		
Formation—	Sweet	Intermediate	Sour
Ellenburger	34	10	7
Canyon	21	3	4
Strawn	17	8	9
Pennsylvania	15	3	5
Spraberry	11	4	4
Devonian	1	23	6
Clear Fork	2	15	14
Silurian		11	1
San Andres	2	3	16
Permian	1	1	15
Other formations	47	14	36
Total classified	151	95	117

price schedules. The few points on Fig. 1 for specific oils which are traded as sweet, intermediate, and sour, are based on refinery realizations for the date of June 23, 1954. Similar realizations now indicate values that are larger by 20-25 cents per barrel.

All of the West Texas crude oils (sweet, intermediate, and sour) are "sour" in the sense of containing hydrogen sulfide and causing corrosion. The average sulfur content is indicated in Table 1 and the average octane number of the gasolines in Table 2. Even geological formation is not a means of classifying West Texas crude oils. During 1951, there were at least 35 major formations. Oils from 13 of these formations are sold under all three schedules. The major formations for the three schedules are indicated in Table 3.

One can scarcely judge the values or distinguish among sweet, intermediate, and sour oils from the average properties of oils sold on the three schedules. Likewise, little can be judged from the few realizations shown in Fig. 1. The classification of oils is so complicated that a completely satisfactory method will never be devised. Nevertheless, the use of a more proper differential such as 4 cents per degree A.P.I. would greatly help the situation and perhaps permit a more realistic appraisal of such other factors as sulfur content, general boiling range, and special properties.

Effect of Base of Oil on Pour Point of Diesel Fuels

What is the effect of base of crude oil on the pour point of the straightrun diesel fuel? Are some crude oils greatly superior to others for this purpose? G.F.C.M.

On the Questions on Technology page of June 28, 1954, (page 132), the general relationship between pour point and characterization factor (and also boiling range) for diesel fuels was shown. However, you are quite right in hoping to find crude oils that have a superior pour-point diesel-index relationship. In this respect, namely a low pour point for a fixed diesel index, well-known types of crude oils behave somewhat as follows:

Gulf Coast oils, Venezuelan and West Texas, California, Mississippi, lowest pour point. Far Eastern, highest pour point.

There are, however, great variations (see Fig. 1). Although diesel index is clearly a function of characterization factor regardless of the origin of the oil, the pour point relation is by no means well defined.

The data shown in Fig. 1 apply to full-boiling-range diesel or distillate-fuel fractions extending from a boiling point of 400° up to 700° F. Lower midboiling-point fuels have lower pour points:

Mid B.P.	Approx. degrees lower than for 550 Mid B.P.*
550° F.	0
525° F.	9
500	20
475	31
450	46

*Less decrease with high-characterization-factor stocks and vice versa.

and it is necessary for almost all U.S.A. refiners to produce a short-boiling-range diesel fuel in order to meet pour-point specifications.

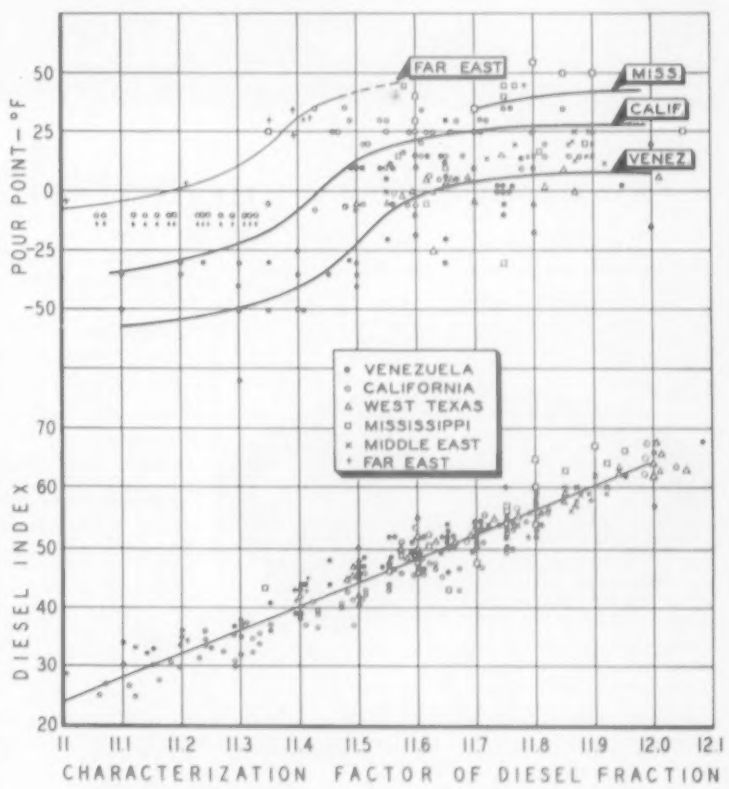
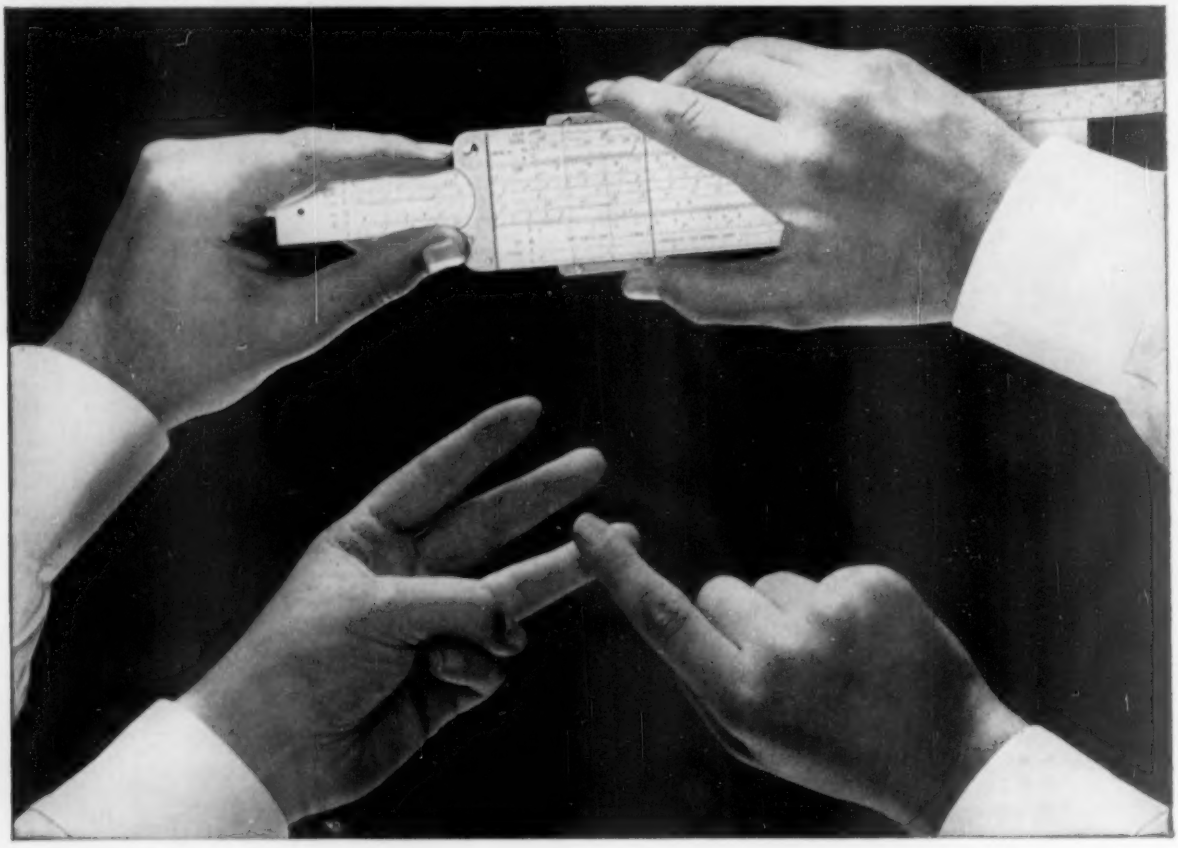


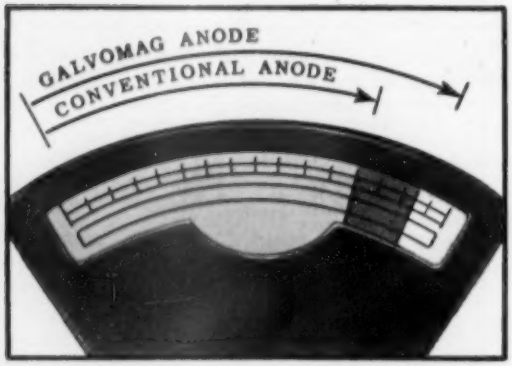
Fig. 1—Diesel indexes and pour points of straightrun diesel fuels.

Any way you figure it . . .

DOW



GALVOMAG anodes are your best buy



25% more current output. GALVOMAG high-potential anodes generate more current—assure protection in high-resistivity soils.

Whether you use an engineer's slide rule or count on your fingers, GALVOMAG* high-potential anodes give you more cathodic protection for your dollar. Take our word for it, or do the mathematics yourself. Either way you get an answer that means less cost with GALVOMAG anodes.

Take high-resistivity soils. GALVOMAG anodes have 25% higher potential than ordinary anodes—give you that extra punch you need without installing extra anodes.

Take average soils. 4 GALVOMAG anodes will do the work of 5 ordinary anodes. Fewer holes are needed so you save 20% on installation costs.

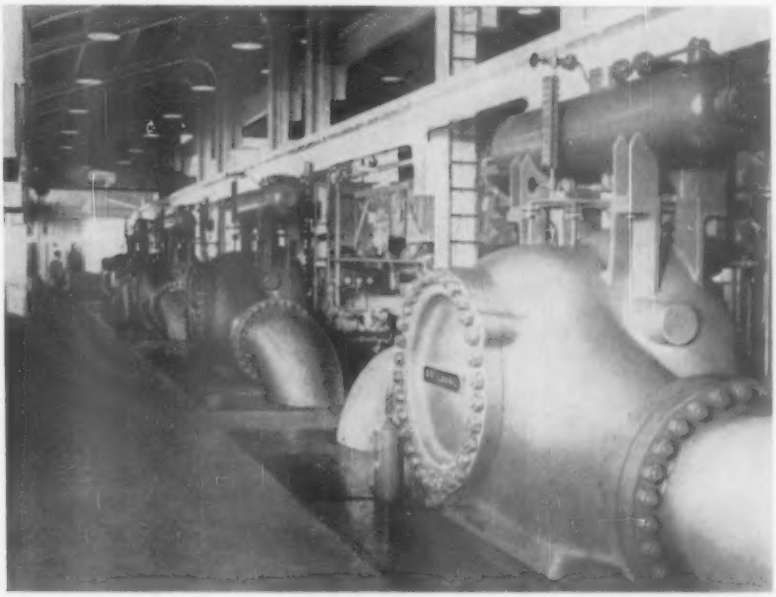
Your Dow anode distributor can translate the advantages of GALVOMAG anodes into dollar and cents savings for your specific application. Call him today. THE DOW CHEMICAL COMPANY, Dept. MA 378Q-3, Midland, Michigan.

*Trademark of The Dow Chemical Company

CALL THE DISTRIBUTOR NEAREST YOU: CATHODIC PROTECTION SERVICE, Houston, Texas • CORROSION SERVICES, INC., Tulsa, Oklahoma • ELECTRO RUST-PROOFING CORP. (Service Division), Belleville, N.J. • ETS-HOKIN & GALVAN, San Francisco, Calif. • ROYSTON LABORATORIES, INC., Blawnox, Penna. • STUART STEEL PROTECTION CORP., Plainfield, N.J. • THE VANODE CO., Pasadena, Calif.

you can depend on DOW MAGNESIUM ANODES

DOW



CENTRIFUGAL COMPRESSORS handle station flow of 930 M.M.s.c.f.d. at Northern Natural's Trescott, Kansas station. Inlet pressure is 477 psig., discharge pressure is 745 psig.

Pipelines discover . . . **Part 1**

Centrifugal compressors offer extreme flexibility

CENTRIFUGAL-COMPRESSOR characteristics are in many ways tailormade answers to some of the most difficult problems facing the pipeline industry. This compressor has joined the steam turbine and the centrifugal pump as a workhorse of modern industry and is used wherever large quantities of air, gas, or vapor must be compressed.

Centrifugal compressors have appeared in many forms, notably blast furnace blowers, process blowers, exhausters, superchargers, and as compressor elements of jet engines and gas turbines.

Centrifugal compressors have thus far been considered principally for use in large pipelines where the gas flow is 300 million standard cubic feet per day or higher. The high-specific-speed impeller is a major development for pipelines carrying 1 billion or more standard cubic feet of gas per day.

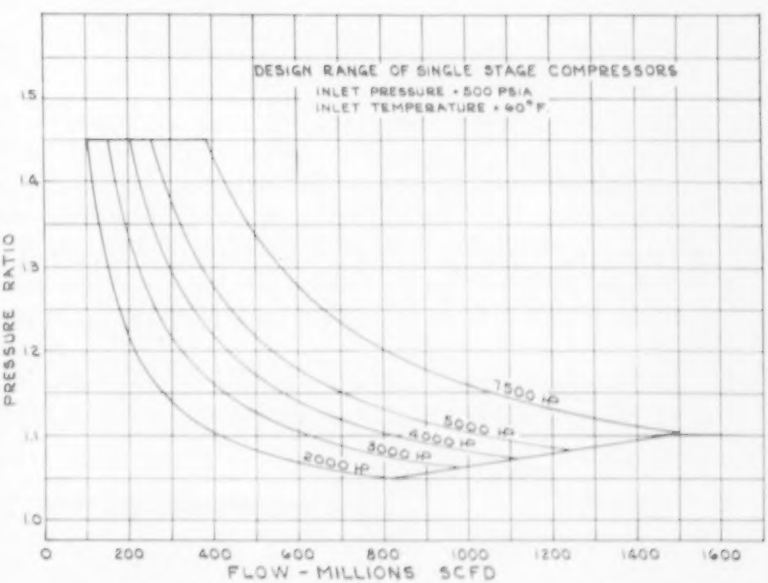
Material furnished by C. F. Koenig III, and L. J. Holveck, De Laval Steam Turbine Co., Trenton, N. J.

On the other end of the scale, thinking is now directed toward small flow pipelines and feeder lines where a single-stage centrifugal compressor will not usually deliver a pressure ratio sufficiently high or absorb enough power to make its use attractive. The solution here seems to be multistage compressors and such machines are being considered seriously.

Advantages . . . The chief advantage of the centrifugal compressor in the pipeline field is its flexibility. Compressors in a typical station are usually arranged for series flow, where each compressor passes the entire station flow and provides a portion of the total pressure boost required of the station. Great flexibility of operation is obtained by varying the speed of the compressors and by adding or dropping units as the station load and pressure ratio change.

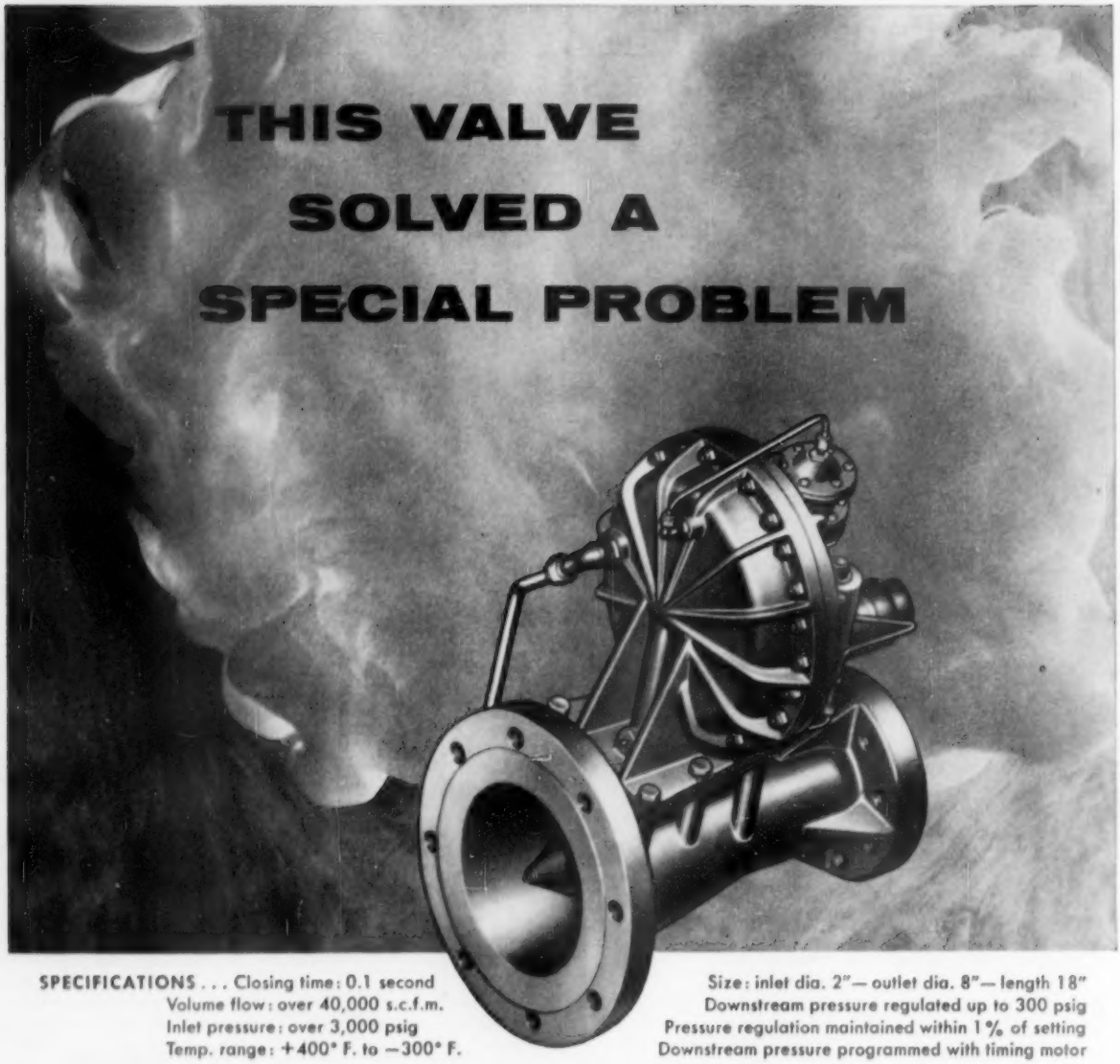
Reduction in line capacity due to loss of a compressor can be largely offset by overspeeding slightly the remaining compressors in the station and those in one or two downstream stations. For constant-speed compressors (motor driven), inlet guide vanes are provided to simulate the effect of changing speed.

Capacity and pressure-ratio rating of a machine may be changed considerably by changing the impeller and diffuser. This feature is particularly useful on new pipelines where the initial flow may be well below the design capacity of the line. In this case, the compressor



SINGLE-STAGE COMPRESSORS may be designed for any point within a broad range of flow and pressure ratios. Fig. 1.

THIS VALVE SOLVED A SPECIAL PROBLEM



SPECIFICATIONS . . . Closing time: 0.1 second
Volume flow: over 40,000 s.c.f.m.
Inlet pressure: over 3,000 psig
Temp. range: +400° F. to −300° F.

Size: inlet dia. 2"— outlet dia. 8"— length 18"
Downstream pressure regulated up to 300 psig
Pressure regulation maintained within 1% of setting
Downstream pressure programmed with timing motor

Fifteen years of AiResearch experience in engineering and fabrication of valves for special applications went into this design.

As you can see from its specifications, the valve shown does a job that has never been done before. This type of valve problem is increasing, particularly in petroleum, chemical, rocketry, atomic energy and research applications.

AiResearch has designed and manufactured thousands of valves to meet special requirements. We are prepared to solve valve problems which include the handling of liquid nitrogen, liquid oxygen and pressurized helium . . . which require operation without fail under the most rigorous extremes of heat, cold and other environmental conditions.

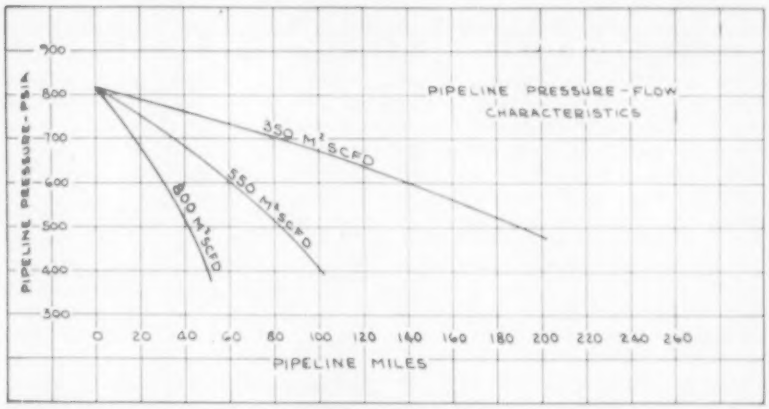
If you have a problem involving specialized valves, we invite you to contact us. Our engineers will analyze your problem with you and recommend a solution.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Boulevard, Los Angeles 45, California

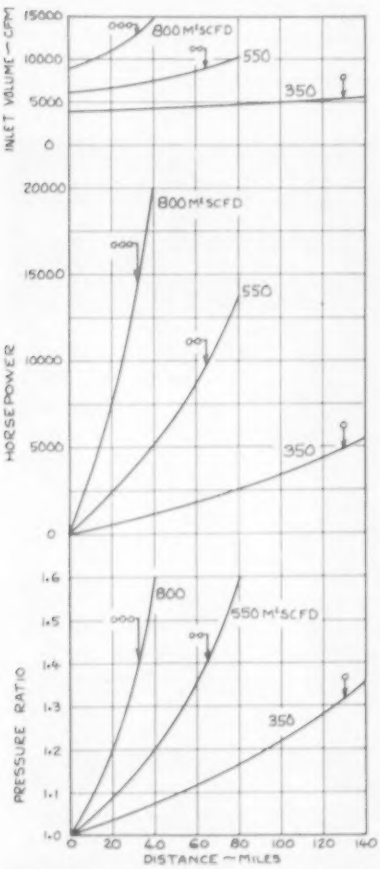
DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



TYPICAL PIPELINES will have pressure-flow characteristics as shown here. These are determined by familiar equations for pipeline flow. (Explained more fully in the next installment of this series). Fig. 2.

is selected for the ultimate condition and impellers of different capacity are designed for each step of growth.

A further advantage is that large amounts of power are contained in relatively small packages. A compressor occupying a space of roughly 10 by 8 by 7 ft. will pass over 1,000 M.M.s.c.f.d. and absorb 7,500 hp.



COMPRESSOR STATION LOCATION, pressures, and horsepowers involved for each growth step of the pipeline. (See the next installment.) Fig. 3.

Operation

In common with fans, propellers, centrifugal pumps, jet engines and the like, a centrifugal compressor does its work by pushing the gas it compresses rather than by squeezing it. The working element of the machine consists of one or more impellers mounted on a shaft which is rotated at high speed by an electric motor, a steam or gas turbine, or a gas engine.

Each impeller is fitted with a series of shaped blades which scoop up the gas at a point near the shaft axis and discharge it at a larger diameter and at a high velocity. The stream is then decelerated in contoured stationary passages so that its velocity head is transformed efficiently into pressure.

Gas enters the unit through a large, flanged opening on one side of the case. It is channeled to the impeller inlet and deceleration is accomplished in a diffuser and volute. The gas leaves the compressor through another flanged opening on the opposite side of the

TABLE 1—COMPRESSOR OPERATING CHARACTERISTICS

Pressure ratios—From 1.05 to 1.5.
Flows—From 5+ to 1,500 million s.c.f.d. or more.
Horsepower ratings—From a few hundred to 15,000 or more.
Operating pressures—Up to 1,000 psi. for normal conditions—higher pressures can easily be handled.
Shaft speeds—From 3,000 to 10,000 r.p.m., depending on compressor size and driver characteristics.
Drivers—May be electric motors, steam turbines, gas turbines or gas engines with step-up gears.

To assure your customers top quality fuels and lubricants, specify

ENJAY

PETROLEUM ADDITIVES

including

ENJAY PARANOX®

detergent-inhibitor additives

and

ENJAY PARATONE®

viscosity index improver

ENJAY

Your only source for a complete line of diversified, high quality petroleum additives (Paranox®).

ENJAY COMPANY, INC.

15 W. 51st St., New York 19, N. Y.

Offices also: Boston • Chicago • Tulsa

Pioneer in Petrochemicals

Write or Wire
for Monthly Stock Lists

● VALVES
● PRESSURE TUBING
● STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

Protect Pipe & Coating against ROCK!
KAPCO ROCK SHIELD
No dirt-padding needed!
Saves Man-Hours & Equipment
Kapco — a tough, mastic composition board, widely used for external protection for pipe in rocky areas, during handling and backfilling . . . easily installed . . . combats corrosion.
MIDWESTERN
PIPE LINE PRODUCTS CO.
Box 1886 Tulsa, Oklahoma

case. Gas velocities at the compressor flanges are normally from 50-80 ft. per second, and are kept as low as practicable to avoid expensive pressure losses.

Within the compressor, the dynamics of the compression call for much higher velocities, and the gas stream leaving the impeller travels at speeds up to 800 ft. per second, depending on the compression ratio developed. The compression ratio varies considerably in modern practice and is governed by the power delivered to the compressor and the quantity of gas to be compressed. As shown in Fig. 1, single-stage compressors may be designed for any point within a broad range of flow and pressure ratios.

Table 1 shows in condensed form some of the principal operating characteristics of the compressor.

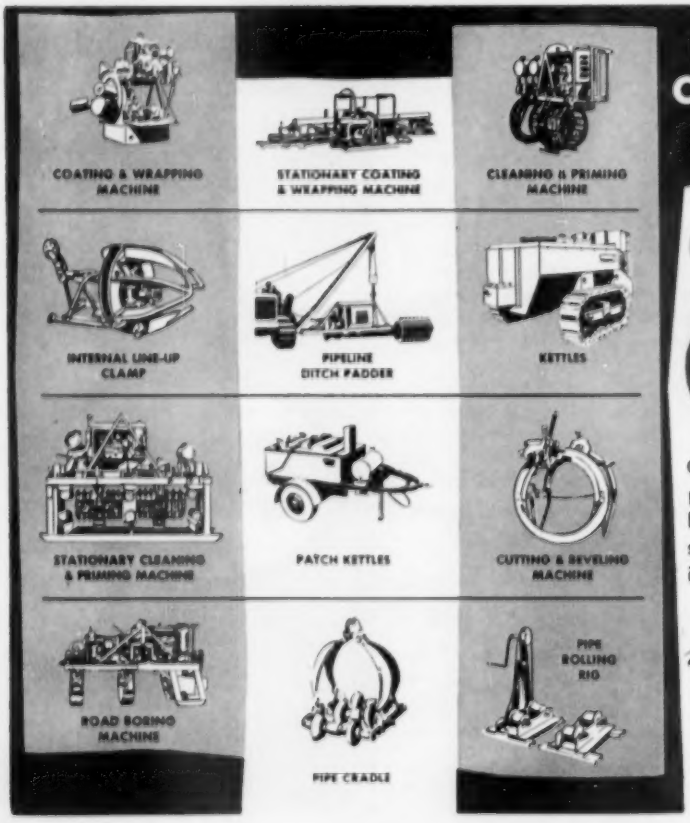
Power required for compression depends on the pressure ratio, the inlet temperature, the number of compressors in series, the supercompressibility factor of the gas, and the efficiency of the compressor.

Accessories . . . All the accessories of the centrifugal pipeline compressor, which are not integral with the unit, are installed in a console. Among these are the oil filters, oil pumps, controls for auxiliary oil pumps, relief valves, check valves and piping. Oil pumps are used both for low-pressure lubricating oil and high-pressure seal-oil service. These pumps may be either motor driven or shaft driven.

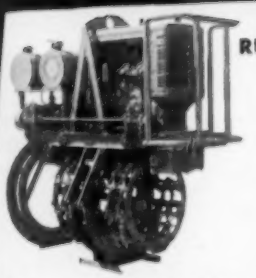
Motor-driven pumps are mounted in the console and shaft-driven pumps are mounted either for direct drive or for geared drive from the shaft. In some cases the compressor and driver have a common lubricating system. Here the main lubricating oil pump is mounted on the driver and the main-seal oil pump is mounted on the compressor.

The sealing system, while not strictly an accessory, may be considered appropriately under this head. The fluid-injection system has proved successful. In general, the injection system employs combinations of two single-sealing elements such as contact seals, bushings, or even segmental carbon rings used as fluid seals. Oil is commonly used as the injected fluid,

Oil leakage takes place through both the atmospheric and gas-sealing elements and is reclaimed and returned to the reservoir. In pipeline applications and other applications where the oil leaking to the gas side is not seriously contaminated by the gas, the oil may be used again and again until its neutralization number indicates exhaustion.



CROSE LINE-TRAVELING CLEANING AND PRIMING MACHINE



RUGGEDLY BUILT YET LIGHT WEIGHT.
Also can be used with stationary base for yard work. Handles pipe up to 36".

Counter rotating heads assure faster cleaning and priming . . . prevent pipe from turning and give better cleaning job. These Crose machines are specifically designed for faster, trouble-free service on the line.

m.j. Crose Manufacturing Company, Inc.
2715 DAWSON ROAD • TULSA, OKLAHOMA • PHONE MAdison 6-2172
New York, N. Y. Ph. BRyant 9-2236 • *Denver, Colorado Ph. EMpire 6-0332
*Houston, Texas Ph. UNderwood 9-3358 • *Newark, N. J. Ph. MArket 4-3650
DISTRIBUTOR: *CROSE-CURRAN LTD. — EDMONTON, ALBERTA — PHONE 3-5135
*Warehouses in 4 locations

Among the

Drilling Contractors

Larkin and Traylor Form Houston Contracting Firm

W. P. LARKIN

J. C. TRAYLOR

T-L Drilling Co., Inc., is a newly formed contact-drilling firm on the Gulf Coast. Operating headquarters are in Houston. Partners in the firm are W. P. (Foots) Larkin and J. C. (Jimmie) Traylor, both veteran oil men.

Larkin started work in the oil fields as a roughneck in 1928. For the past 17 years he has held supervisory positions with both contractors and independent operators in Texas, Louisiana, and the West Coast.

Traylor has had 25 years of experience in the industry, working in various capacities with major oil and service companies. He is a graduate of Wesley College, and majored in petroleum engineering at Texas A. & M. College.

Warren-Bradshaw Drilling Co., Tulsa, will drill for The Texas Co. at a wildcat location 5 miles north of Beaver, in Beaver County, Oklahoma Panhandle. Contract calls for a 6,900-ft. test at 1 Hinkle, in 18-5n-24eCM.

Kentucky Driller Moves Third Rig Into Alabama

R. H. Norris, Glasgow, Ky., has put his third cable-tool rig to work in northwestern Alabama's portion of the Black Warrior basin. It is a newly purchased 36-L Bucyrus unit, and is on a well-deepening job for Warrior Basin Oil Corp. in Marion County. The well, 1 Childers-Miller unit, in 12-9s-15w, will be taken from its old total depth of 3,755 ft. to 4,500 or 5,000 ft. for a look at the Knox dolomite.

Norris also is drilling for Duffy & Rowe in Franklin County, and for Robert J. Schindler, Sr., in Walker County. The latter job, just south of Saragossa, is a 2,500-ft. test, the second on the operator's lease from First National Bank of Birmingham. It is less than a mile from the first test, an indicated small gas-discovery well in Hartselle sand at 1,849-69 ft. The Duffey & Rowe test, 1 Hester-White, in 34-8s-12w, about 6 miles east of Hodges, in the southern part of the county, just north of the Marion County line.

Cactus Drilling Co., San Angelo, Tex., has two additional deep tests under contract for Austral Oil Exploration Co. in the Townsend Wolfcamp

ON THE FLOOR of a rig Padre Drilling Co., Corpus Christi, has been operating in the active development of deep sands around the old Pierce Junction dome, at the southwest edge of Houston, in Harris County, Upper Texas Gulf Coast. Standing, left to right: L. T. Shelton, Shelton Oil Service Co., Corpus Christi; J. E. Childers, and L. D. Holcombe, crewmen; "Pewee" Pearson, driller; Floyd Chandler, tool pusher; and H. E. Peters, crewman. Front, kneeling: Tink Fuller, crewman.

bargain thread dope?

Is cheap thread dope really a bargain? Tool joint and drill collar thread wear can cost a lot over a year's time. Fishing jobs come plenty high. Galling or washouts mean hundreds of dollars of extra expense. 'Bestolife Lead Seal stretches thread life, cuts down on fishing jobs, galling and washouts. That's why it's the most widely used lead base thread compound in the world.

Get 'Bestolife at your supply store. In 1¼, 5, 20 and 50 lb. cans. Unconditionally guaranteed.

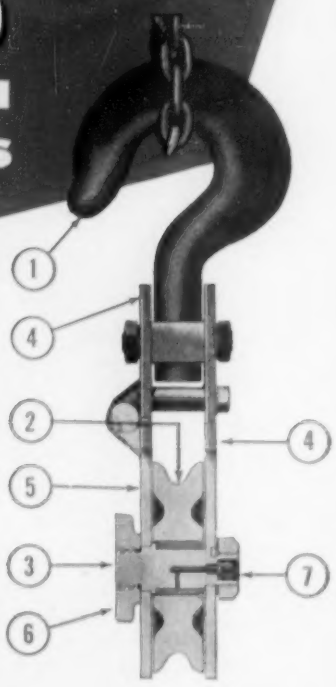
I. H. GRANCELL
1601 EAST NADEAU STREET
LOS ANGELES 1, CALIFORNIA

NOW BUYS
MUDWONDER

Lynn D. Durham of Durham Drilling Co. now buys Mudwonder Mudline Valves to cut operating costs.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.

THE Inside Story of WECO SNATCH BLOCKS



These design and construction features are the reasons for the outstanding performance, easy handling, long life and dependability you'll get from WECO Snatch Blocks in a multitude of services.

1. Drop-forged, heat-treated hook has 100,000 lb. capacity.
2. Forged steel sheave is precision machined and accurately gaged, assuring longer life for sheave and rope.
3. Extra heavy sheave pin has "Super Oilite" bearing for smooth-running strength.
4. ⅜" steel plate resists distortion.
5. Drop-Side (patented) is hinged for easier handling and stringing.
6. Wing nut, tightened or loosened with hammer, holds drop-side in place.
7. Zerk fitting for sheave pin lubrication.

25-ton working load capacity; available in 6", 8" or 10" sizes.

U-10-55

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

area, west of Lovington, in Lea County, southeastern New Mexico. Both are set up for 10,750 ft. They are listed as Austral's 2 and 2-B State. Locations are in 1-16-35.

Creighton Drilling Co., Tulsa, has a rig working for Ambassador Oil Corp., of Oklahoma City, at a wildcat location 3 miles east of Ridgeway pool, in Beaver County, Oklahoma Panhandle. It is a 7,600-ft. contract with location at 1 Overton, in 5-3n-26eCM.

Webster Drilling Co. is contractor on a 7,300-ft. test Eason Oil Co., of Oklahoma City, is putting down about 9 miles southwest of Buffalo, in Harper County, northwestern Oklahoma. Location, at 1 Price, in 21-26n-23w, is about 6 miles east of the old Southwest Stockholm area.

R. W. Rine Drilling Co., Wichita, is drilling on a 6,150-ft. test for Monsanto Chemical Co. in southern Meade County, southwestern Kansas, near the Oklahoma line. Location at 1 Marion, in 14-35s-27w, is 6 miles southwest of McKinney gas field.

Pernie Bailey Drilling Co., Houston, has a new contract operation in the North Oretta area, in southern Beauregard Parish, southwestern Louisiana. It is an 8,960-ft. test for Slick Oil Corp. at 1 Musser-Davis, in 21-16s-11w. Location is about ½ mile west of production. The area is about 6 miles northwest of DeQuincy.

Cook Drilling Co., Fort Worth, is contractor on another Smackover test Carter Oil Co. is starting in the Red Rock area, Webster Parish, northwestern Louisiana. The test is Carter's 1 Sanders-O'Brien Unit C-517, in 11-23n-9w. Depth objective is about 11,700 ft.

Gene Reid Drilling, Inc., Bakersfield, Calif., is contractor and joint operator with Exeter Oil Co. on a deep exploratory test midway between Taft and Maricopa in a shallow producing area in the Midway-Sunset field, in the west-central part of Kern County, southern California. Drilling is set up to go to 7,500 ft. The test is listed as 31-1 Exeter-Reid. Spot is in 31-32-24.

Clegg & Hunt, Houston, will drill a 10,400-ft. test for San Jacinto Petroleum Co. in the Coulee Hippolyte (South Lake Charles) area, south of Lake Charles, in Calcasieu Parish, southwestern Louisiana. Location is at 1 Kelly-Weber & Co., in 4-11s-8w, south of the two wells previously completed in the area.

Unibestos...the only single-layer pipe insulation that provides positive protection at the joints

Unibestos is the only single-layer pipe insulation that's built with the strong, long interlacing fibers of Amosite, the quality asbestos from South Africa. This unique construction permits single-layer Unibestos to form positive heat seals at hard-to-insulate joints and fittings...to provide more protection against heat loss than other single- or even double-layer insulations.

With Unibestos on the job, there is less shrinkage...more resistance to moisture, acid and chemical fumes...greater toughness to withstand shock and vibration. Easy to miter, easy to cut, this durable insulation goes on the most complex pipeline systems quickly and economically.

Fast, low-cost application...long-lasting, positive protection—these are the reasons why Unibestos is becoming the specified insulation for more and more of today's industrial operations. Unibestos® is available in sectional form through 44" O.D.

Joe Bestos says:

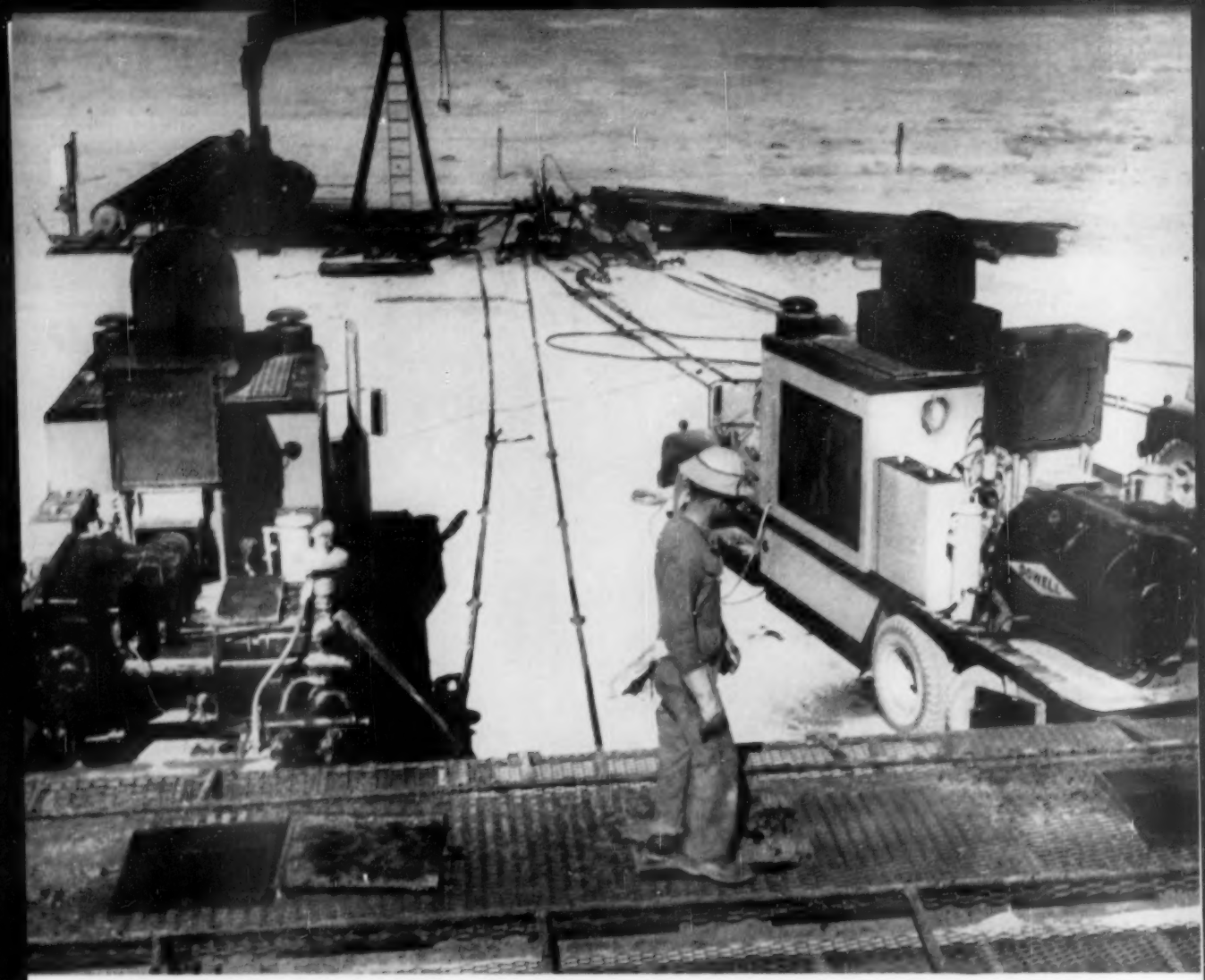
Remember when insulating those tough fittings, single-layer Unibestos locks in more heat than other single- or double-layer insulations!

For complete information write...

UNARCO

UNION ASBESTOS & RUBBER COMPANY

1111 West Perry Street • Bloomington, Illinois



Large volumes being delivered by high-horsepower Allison-powered pumping units during an Acid Petrofrac treatment.

Double-acting treatment dissolves while it fractures

ACID PETROFRAC® is a real two-fisted Dowell service for increasing oil and gas production. High acid content and excellent sand carrying ability make it highly effective as a combination acidizing-fracturing treatment.

There are other benefits, too.

You won't be troubled with silicates swelling to plug porosity. Acid Petrofrac has silicate control properties built in. Fluid loss? No problem, either. And, if necessary, you can vary the acid strength to meet specific formation conditions.

Retarded acid action is another natural feature of Acid Petrofrac. Acid Petrofrac fluid, without sand, is even being used as a retarded acid to stimulate production from many problem formations. It is getting results where regular acid treatments have failed.

You'll save money with less downtime when you use Acid Petrofrac. Fast breakout and cleanup put your well back on production in a hurry.

For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write to Dowell Incorporated, Tulsa 1, Oklahoma, Dept. J-11.

services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

The OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

Portable Chromanette Offers Rapid Gas Analysis

This new chromatograph is portable and weighs only 15 lb. Known as the Series 9495 Chromanette, it is 24 in. high, 26 in. wide, and 5½ in. deep. It completes an analysis in from 5 to 20 minutes. It is designed for use in the plant, field, or laboratory and will see service in refineries, field-processing plants, petrochemical plants, and pipelines.

The instrument performs both qualitative and quantitative analysis of most gaseous mixtures. Accurate to about 1 per cent, it gives composition readings directly — no calibration is needed. The instrument requires only 1 to 5 ml. of gas for a complete quantitative and qualitative analysis. **For more information write or call: Podbielniak, Inc., 341 East Ohio Street, Chicago 11, Ill.**

•

Device Indicates Tank Level From 4,000 Ft. Away

Refineries can be equipped with this remote-control device that measures the level in storage tanks located more than three-quarters of a mile away. Called a capacity telemeter, the unit can be connected by a coaxial cable to a control position as far as 4,000 ft. away. Its accuracy in gaging the contents of a tank is unaffected by changes in weather conditions or electrical properties of the cable.

The instrument is being used by chemical and petrochemical plants, refineries, and other industries with materials stored in tanks scattered over a sizable area. The complete capacity-telemeter system consists of a measuring unit, a remote probe unit for each tank, and an indicator which can be a meter, recorder, or precision indicator.

For more information write or call: Fielden Instrument Division, Robertshaw-Fulton Controls Co., 2920 North Fourth Street, Philadelphia 33, Pa.

Cementing-Unit Capacity Is 425 G.P.M.

A new high-volume, high-pressure cementing and pumping unit in a cab-over design, this Model 111TA unit is capable of mixing and pumping 425 gal. of cement per minute. Rated at 510 hp., this 111TA unit develops pressures up to 8,000 psi. It uses a Diamond T chassis with a 335-hp. engine and carries a newly designed Gardner-Denver PA-8K triplex pump 4½ by 8 with 8,000 lb. working pressure. It also carries a Gardner-Denver FC-VXXU pump 4½ by 8 with 3,000 lb. working pressure. Power for the high-pressure pump is furnished from the 335-hp. truck engine through a 10-speed transmission, special power take-off and drive lines. A 175-hp. engine on the deck at the rear of the unit supplies power to the low-pressure pump through a torque converter and two-speed transmission.

A jet-type mixer receives water from the low-pressure pump. A 200-cu.-ft. two-compartment displacement tank, each compartment holding 100 cu. ft.

The OIL AND GAS JOURNAL Showcase Coupon

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

MANUFACTURER _____

ADDRESS _____

CITY _____ STATE _____

Please send me complete information on the following item

_____

_____

Described in the Oct. 22, 1956, issue of The Oil and Gas Journal

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

DATE _____

of fluid, mounts behind the truck cab.

A suction manifold design permits drawing of fluid from either or both tank compartments to either or both pumps individually or simultaneously. The new efficient alloy high-pressure discharge manifold permits discharging of fluid to the well from both pumps through one discharge line. Individual discharge lines are also provided, enabling the operator to displace fluid and pressurize the well annulus simultaneously. **For more information write or call: BJ Service, Inc., Long Beach, Calif.**

●

Transistorized Detector Finds Pipeline Leaks

The new M-Scope leak detector, using five miniature hermetically sealed transistors, provides several times more amplification of the leak sounds than in previous models. At the same time weight, size, and battery requirements are greatly reduced so that the new leak detector is truly a portable instrument. The weight is only 7 lb.

Use of transistors completely eliminates the problem of microphonic tubes, reduces battery drain, and makes possible a more rugged and compact unit. A built-in battery test circuit is included for easy maintenance. Controls and operation have been streamlined and simplified.

Typical applications are in the detection and location of leaks in water and oil pipelines beneath soil, pavement, or cement; the testing of newly completed lines for leaks; and the location of leaks beneath cement floors in buildings. **For more information write or call: Fisher Research Laboratory, Inc., 1961 University Avenue, Palo Alto, Calif.**

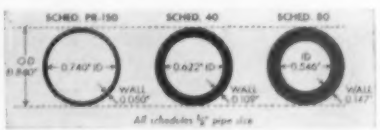
●

Plastic Pipe Offers High Corrosion Resistance

A new line of light-wall polyvinyl chloride pipe maintains a uniform pressure in all sizes. Known as Schedule PR-150, this series represents an addition to the firm's recently announced Schedule 40 and Schedule 80 pipe. Its generally thinner wall and larger i.d. give it greater flow capacity than Schedule 40 and 80 in the same nominal pipe sizes.

The new series offers two basic types: One has high chemical resistance and a maximum working pressure of 150 psi. at 75° F. The other has high impact strength and a rating of 125 psi. at the same temperature.

A rigid unplasticized material, this pipe offers eight sizes ranging from ½ to 4 in. Wall thicknesses range be-



Otis Side-Door Tools

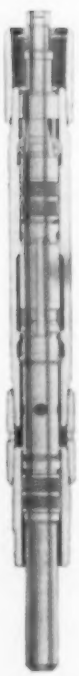
Otis... "First in Pressure Control"

Type S S

Otis Side-Door Tools are now available in "S" dimensions . . . The new, standardized series for Otis "selective" landing nipples.

◀ OTIS SIDE-DOOR CHOKE

OTIS SEPARATION TOOL ▶



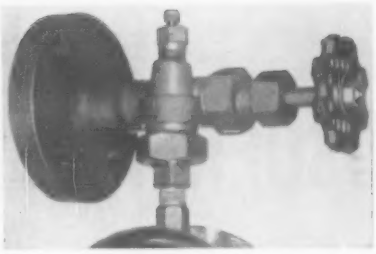
tween 0.050 and 0.230 in. All pipe in the series is furnished in standard 10 and 20-in. lengths with plain ends.

Both types of pipe in this series offer high resistance to a broad group of corrosives. The pipe is odorless, nontoxic, nonporous, tasteless, noncontaminating, abrasion resistant, and nonflammable. Its friction loss is about one-half that of steel. The pipe (1) has excellent electrical characteristics, (2) is nonelectrolytic, (3) makes a low heat conductor, and (4) has excellent electrical resistivity. **For more information write or call: Alloy Tube Division, The Carpenter Steel Co., Union, N. J.**

•

Instrument-Piping Valve Saves Connection Space

This new valve for instrument piping and general use acts as a block valve as well as greatly reducing the number of threaded connections required. The No. 66U-VG valve is an offset type. A vertical rising-ball check on the downstream side of the seat and a solid-shank connection to the vessel permits its use as either a block or a root valve. This makes it possible to eliminate the usual block valve.



The valve combines unions, nipples, reducers, elbows, tees, valve, and drain valve into one space-saving unit, greatly reducing the number of threaded connections. It has a double-seating stem for repacking under pressure and a pressure bleeder valve and test-gage connection. The seats are regrindable and renewable. The valve has a union connection to the gage. **For more information write or call: Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.**

•

Tubing Spool With 45° Outlets Improves Gas Flow

A new tubing spool with enlarged 45° outlets for gas wells is finding favor in western Canada. It improves gas flow and prevents service interruptions caused by freezing condensate.

The Y-type tubing-spool design reduces flow restrictions and minimizes cutting and washing action where gas production contains sand or other solids.

The general construction of the Y-type spool not only permits better flow characteristics but also presents

for Dual Completions

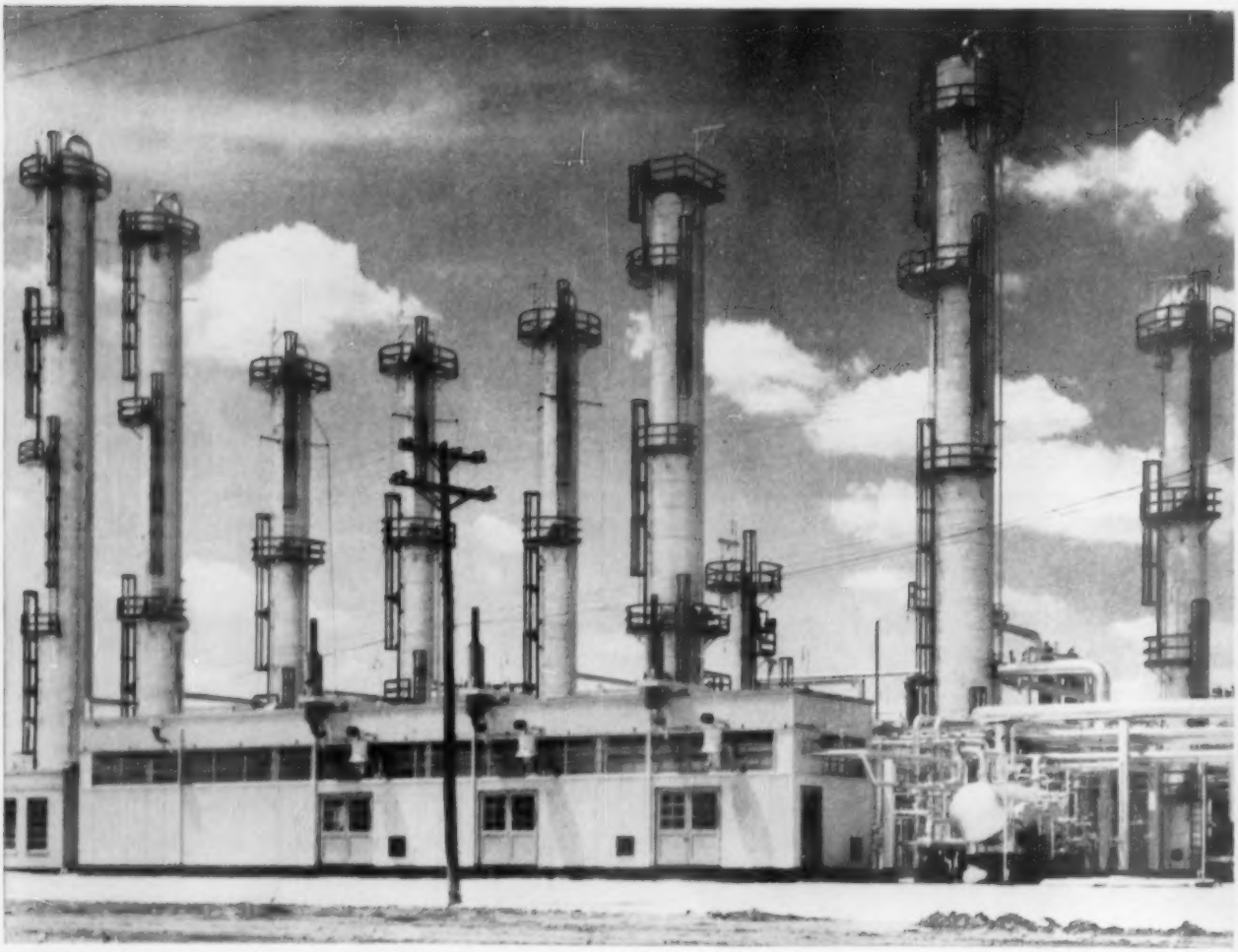
More than 20 two-zone completion and production operations are possible with Otis Removable Side-Door Chokes, Otis Separation Tools, and related Otis Side-Door Equipment. These Otis sub-surface controls provide a simple and economical method of completing and producing two zones through the same well bore without commingling the fluids. Dual completions allow the economical production of so-called "stray" oil and gas formations which normally would not be feasible nor practicable to produce. If you are about to complete or re-complete a well in a multiple-pay area, talk to your nearest Otis office about installing side-door equipment. They will be glad to give you illustrated literature and complete details without obligation.

OTIS PRESSURE CONTROL, INC.

BRANCHES THROUGHOUT THE OIL COUNTRY

PROCON BUILDS UOP REXFORMING UNIT FOR COSDEN IN RECORD TIME

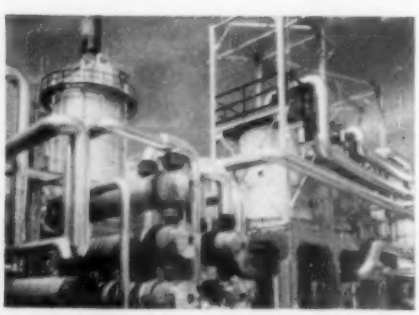
Another important oil refinery construction achievement for Procon



New Rexforming unit at Cosden just after going on stream

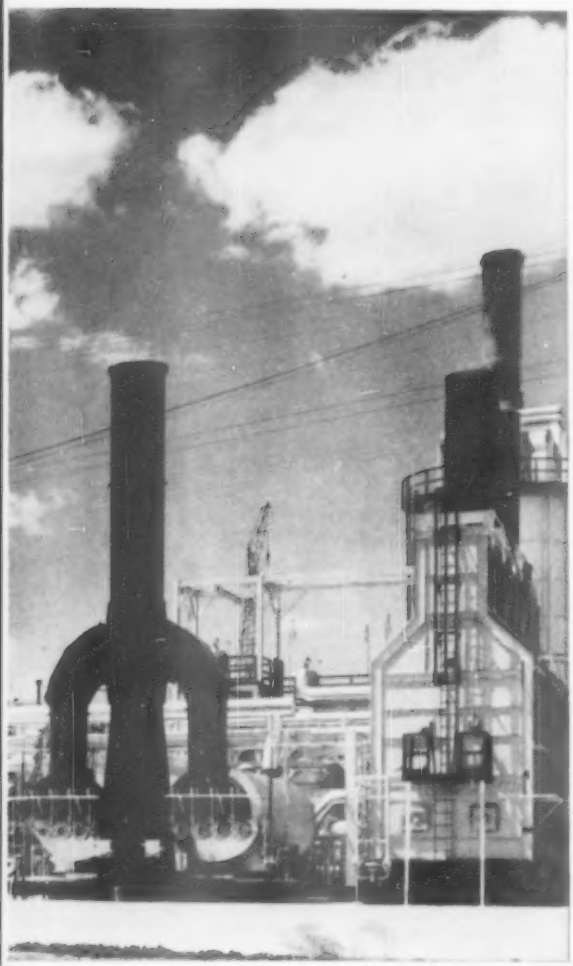
Ray Tollett, President (center) and Dan Krausse, Vice President, Manufacturing (left) of Cosden congratulate Martin McReynolds, Field Construction Superintendent for Procon

This control room directs the operation of the Rexforming unit



The heart of the Rexforming unit, the Reactors

Some months ago, Cosden Petroleum Corporation, Big Spring, Texas, gave Procon the responsibility of building their new Rexforming refining unit. Cosden's requirements for the construction specified completion "at the earliest possible time". Procon finished this project, the first Rexforming unit anywhere in the world to be built wholly from the ground up, in approximately six months. It is an outstanding example of Procon's ability to meet the most exacting construction requirements on time and right up to every specification.



Site 30 days after ground breaking

Ground was broken for the new Rexforming unit on January 18, 1956 and completion was promised in approximately six months. In order to meet this time requirement, Procon engineers realized it was necessary to break away from routine methods and use every time-saving method possible consistent with good construction practice. Accordingly, it was decided to proceed as far as possible with the basic construction even before the major columns could be finished and placed in position. This presented a delicate problem since, as the columns were completed and delivered, it was necessary to move them into position with the rest of the construction being ahead of the usual status for their easy installation. This was handled without flaw by the Procon construction crew on the job and the new unit went on stream just 190 days after ground had been broken.

Column just fits in space between partly completed construction

Column is carefully maneuvered into place

One of the principal problems was the positioning of the extractor column, RXV10, the largest in the unit. It had to be fitted carefully into the half-completed construction and maneuvering it into position in a space that permitted only a few inches leeway was an unusually competent construction accomplishment.

Procon offers a complete engineering service for the oil refining, petrochemical and chemical industries. When you give the job to Procon, you can be sure of completion on time and up to every specification.

PROCON *Incorporated*

1111 MT. PROSPECT ROAD, DES PLAINES, ILLINOIS, U.S.A.

PROCON (CANADA) LIMITED, TORONTO 18, ONTARIO, CANADA
PROCON (GREAT BRITAIN) LIMITED, LONDON, W. C. 2, ENGLAND
PROCON INTERNATIONAL S. A., SANTIAGO DE CUBA

WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

OIL AND GAS JOURNAL Showcase
.....OF NEW EQUIPMENT

a streamlined-surface assembly which will enhance completion appearance.

For more information write or call: The National Supply Co., Two Gateway Center, Pittsburgh, Pa.

•

Ratchet-Lever Hoist Lifts 1½ Tons to 15 Ft.

This ratchet-lever hoist, with 1½-ton capacity, lifts to 30 ft. It allows long pulls and lifts, thus eliminating the need for any staging. The new Model 3000-30 weighs only 13¾ lb. and includes a flexible aircraft cable that permits lifting, pulling or lowering a 1½-ton load a distance of 15 ft. or a ¾-ton load a distance of 30 ft.

With a main frame of high-grade aluminum alloy, the hoist features oiled-for-life bearings, three workable hooks, smooth operation in any position, and a built-in pulley that can be used as a snatch block in close-quarter work. A safety handle bends before the unit can be overloaded to prevent costly accidents. An interlocking-pawl system securely locks the load. There are no brakes to slip. Free release only operates under no load conditions. **For more information write or call: The Lug-All Co., 355 Lancaster Avenue, Haverford, Pa.**

•

Welding Fitting Provides For Instrument Hookup

A branch-welding pipe fitting provides for construction of angular-branch connections with a full-penetration weld. Elbolets are used for making 45° connections for directional flow and instrument connections, and for connections into elbows for instruments, drips, and hanger and support connections.

For more information write or call: Bonney Forge, Allentown, Pa.

•

Coupling Features 360° Swivel Joint

The Flanco four-bolt split-flange pressed-on coupling features a newly developed and patented 360° swivel joint for convenience in positioning and installing. This new swivel prevents danger of hose twisting. It eliminates pipe-threading operations, use of separate union and swivel connectors, gaskets, and sealing compound.

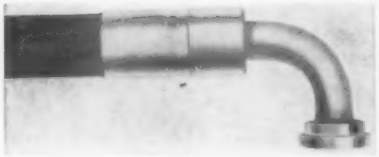
The new swivel is available in all sizes from ½ through 1½ in., in all standard bends from 0° to 90°. Only

ONE THING YOU CAN COUNT ON—

QUALITY made Larkin the Leader

You can buy Larkin Fittings through your supply store with full confidence that they are the finest fittings money can buy.

Hexagonal Swages and Bull Plugs • External Upset Swages and Sub-Tubing Nipples • Refinery Swaged Nipples and Bull Plugs • Seamless Casing Nipples • Seamless Tubing Nipples • Steel Tubing Couplings • Substitute Couplings • Sub-Tubing Nipples and Pup Joints • Perforated Tubing Nipples • Adaptor Nipples • Boiler Nipples • Choke Nipples.



small automotive-type wrenches are needed to make up a joint. **For more information write or call: Anchor Coupling Co., Inc., 342 North Fourth Street, Libertyville, Ill.**

●

Pipe Expansion Joint Shaped From Polyvinyl Chloride

A slip-type pipe expansion joint of unplasticized polyvinyl chloride is made in 1, 2, and 3-in. sizes. It may be used with piping of smaller diameters by employing reducing bushings. All sizes allow an expansion of 3¾ in.

The new expansion joint is designed for use with rigidly fixed PVC piping subjected to thermal cycles. It has a Neoprene O-ring packing and is suitable for a wide range of corrosive services. When made of normal impact PVC, the 1-in. size has a pressure rating of 205 psi. at 75° F., and of 120 psi. at 140° F.; the 2-in. size has a pressure rating of 170 psi. at 75° F., and of 100 psi. at 140° F.; the 3-in. size has a pressure rating of 150 psi. at 75° F., and of 90 psi. at 140° F.

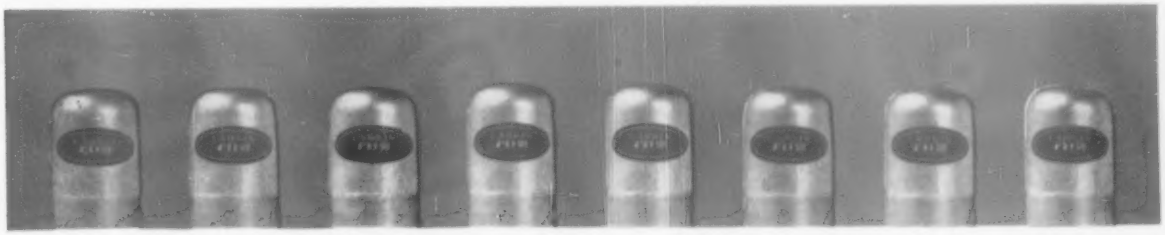
The joint has been tested at pressures up to 325 psi., and temperatures up to 140° F. **For more information write or call: Tube Turns Plastics, Inc., 2929 Magazine Street, Louisville 11, Ky.**

●

Trailer Houses Crews In Rough Country

A valuable aid to exploration and development of new oil fields in the United States and Canada, the Campcar is a specially designed trailer to house geological crews, maintenance crews, and development gangs in homelike comfort at the site. It can be moved over rough terrain behind any type of motor vehicle.

The Campcars offer three standard lengths, 21, 25, and 35 ft. There are seven different types of Campcars, all of which can operate at or away from city utilities: (1) A two-to-five man self-contained unit; (2) a dormitory unit, with upper and lower bunks, to accommodate up to eight men and containing lockers, washroom, shower, and toilet facilities; (3) a single-unit complete kitchen with sanitary and living quarters for a cook and helper; (4) a dining and recreation unit to accommodate up to 22 men; (5) a combination kitchen, dining, and recreation unit for eight men; (6) an office and storage unit that sleeps two men, with a large partitioned area for light tools, supplies, or engineering facilities; (7) a two-man unit with complete sanitary, cooking, and living facilities. **For more information write or call: Morrison Railway Supply Corp., Box 185, Station F, Buffalo 12, N. Y.**



LARKIN PACKER COMPANY, INC.

WAXAHACHIE, TEXAS

LARKIN

...Through Your Supply Store

PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

AT LAST . . . .
A STANDARD PIPE ANCHOR

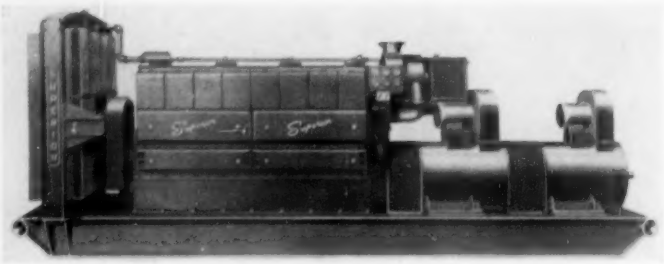
Bos-co
UNIVERSAL
PIPE ANCHOR

- Less expensive than special strap anchors.
- Handier; no more waiting to have anchors made.
- Pipes of same size can be stacked and valuable space saved.
- Adaptable to many uses.

Available At Your Supply Store

Bos-co
EQUIP'T ENG'R'G & MF'G.
526 South Boulder Ave., Tulsa, Oklahoma

The OIL AND GAS JOURNAL Showcase
.....OF NEW EQUIPMENT



Diesel-Electric Plant Powers Rig

A diesel-electric drilling-rig power plant drills to 20,000 ft. in offshore or inland drilling service. It is offered in two models: one employs a six-cylinder engine and the other an eight-cylinder engine. Rated at 675 and 900 hp., they are available in a choice of diesel, gas, or dual-fuel operation.

The package consists of two or more engine-generator sets, a minimum of three drive motors for the draw works and two mud pumps, a console-type control stand, and a terminal cabinet to house all electrical equipment. Each engine-generator set has an engine and two generators.

The motors are of heavy-duty, six-pole construction. The Westinghouse generators in the units are 550 kw. d.c. Since the mud-pump drives and generators are basically identical in construction, parts can be interchanged.

Electric-power transmission simplifies location of the power plant with respect to the derrick or drilling floor. Mud pumps may be freely located because electric power cables can be run anywhere. Simplified controls are located near the draw works to give the driller control over the selection of generators, amount of power, and speed of the units. **For more information write or call: White Diesel Engine Division, White Motor Co., Springfield, Ohio.**

•

Plastic Water-Well Casing Reduces Installation Time

A new lightweight plastic well casing is manufactured in a single dimension (o.d., 5.563 in.; i.d., 5.200 in.). Twenty-foot lengths are manufactured with plain end. A coupling is furnished with each joint.

The new well casing may be easily perforated by the use of a standard hand or electric drill.

Assembling 40-ft. joints before installation materially reduces the time required for running. Due to its light weight, these 40-ft. lengths are easy to handle. The new material is recommended for suspension up to 300 ft. The product is not recommended as drive casing or as surface casing to be cemented in place and drilled through.

For more information write or call: Southwestern Plastic Pipe Co., P. O. Box 117, Mineral Wells, Tex.

This advertisement is not and is under no circumstances to be construed as an offering of any of the securities for sale or as a solicitation of an offer to buy any of such securities. The offering is made only by the Prospectus.

NEW ISSUE — October 4, 1956

BAHAMAS HELICOPTERS LIMITED

American Depositary Receipts for

300,000 Ordinary (Common) Shares

(£1 Par Value)

Price $5 per Share

Copies of the Prospectus may be obtained in any State only from such of the several Underwriters as are registered dealers in securities in such State.

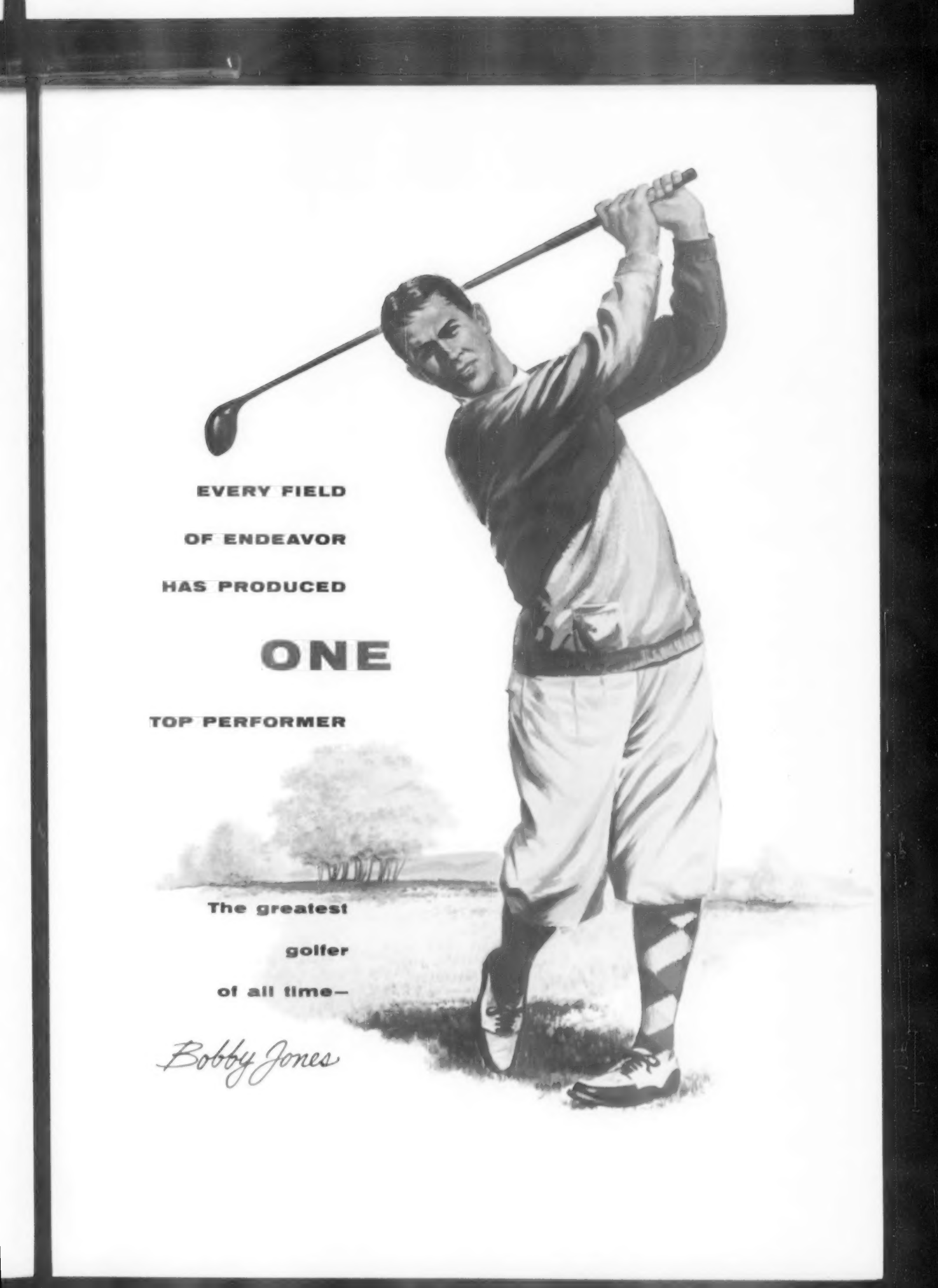
Blair & Co.
Incorporated

Bear, Stearns & Co. — Dempsey-Tegler & Co

Scherck, Richter Company — H. Hentz & Co.

Blunt Ellis & Simmons — Granbery, Marache & Co.

Loewi & Co.
Incorporated


EVERY FIELD
OF ENDEAVOR
HAS PRODUCED
ONE
TOP PERFORMER
The greatest
golfer
of all time—
Bobby Jones

EVERY FIELD OF ENDEAVOR

HAS PRODUCED **ONE** TOP PERFORMER

In golf it was Bobby Jones

For pumping dirty oil wells it is the

oilmaster

MULTIPLE TUBE PUMP

Its design and general construction can, has and will be copied, but THIRTY YEARS OF EXPERIENCE and KNOW-HOW in this field of endeavor are the exclusive property of FLUID PACKED PUMP CO.

FREE REPRINT AVAILABLE
Reprints of the illustration of Bobby Jones without advertising sent on request

FLUID PACKED PUMP CO.
Main Office and Plant, Los Nietos, Calif.

Distributed by the National Supply Co., Pittsburgh, Pennsylvania • Export: The National Supply Co., Export Division, 600 Fifth Ave., New York • Co-Distributors: Berry Supply Store, Beacon Supply Co., Industrial Supply Co.

oilmaster PUMPS
FOREMOST IN THE INDUSTRY

MURPHY PROTECTS
DAY AND NIGHT

MURPHY
Safety Switches Protect All Unattended Oilfield Engines

MURPHY Automatic Switches Are All You Need

NEW
MODEL W-275
for Single Magneto Engines

Featuring new automatic lube oil disconnect switch. Pushbutton sets lockout. Normal oil pressure automatically resets switch when engine is started.

Model W-275-D, slightly larger panel, provides space for #101-D instant snap switch for dual magneto engines.

All Murphy controls are heavy duty, field-tested, made of finest materials, guaranteed one full year. Low-cost replacement parts quickly available.

See Your Oilfield Engine Dealer or Write for Information

FRANK W. MURPHY Manufacturer
BOX 1474 TULSA, OKLA.
BRANCH LOS ANGELES 61, CALIFORNIA

ANNOUNCING

Second Edition of
D. H. Gregg's
SHORT SUMMARY OF TEXAS LAW RELATING TO OIL AND GAS

$7.50

South Texas College Book Store
1600 Louisiana Street
Houston, Texas

TO CHANGE YOUR ADDRESS

IT'S BEST . . .
to send your old address clipped from the Journal mailing wrapper along with your new location.

ADVANCE NOTICE . . .
10 days before you move, and we guarantee you week-to-week undelayed service.

WRITE . . .
Circulation Department
THE OIL AND GAS JOURNAL
Box 1260 Tulsa 1, Okla.

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

New Air-Cooled Selenium Rectifiers for Cathodic Protection Against Corrosion is the title of an information sheet. The two-color, two-page sheet contains photographs, lists design features, and presents specifications. A two-color wiring diagram is included. **For more information write or call: Corrosion Services, Inc., P. O. Box 7343, Tulsa, Okla.**

•

Parker Tubing System Data. Catalog File 4305, an eight-page booklet, contains information including charts and tables to aid in proper selection of tubing as to size, wall thickness, and material for various operating conditions. Factors considered are flow requirements, pressures, and severity of service and temperatures. **For more information write or call: The Parker Appliance Co., Tube & Hose Fittings Division, 17325 Euclid Avenue, Cleveland 12, Ohio.**

•

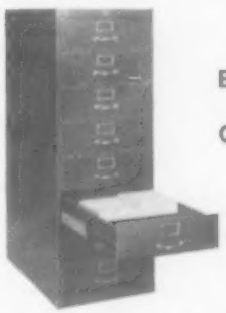
Belmont Mechanical Packings are described in the new 24-page condensed Catalog 56. It contains 246 types. Featured are recent packing developments including the multipurpose Bel-Vee V-ring packings, the new long-wearing crisscross braid packing series, twisted-foil packings for oil and distillate temperatures to 1,000° F., and a new Inconel-wire reinforced-plastic packing for valves handling superheated steam at temperatures up to 800° F. **For more information write or call: Belmont Packing & Rubber Co., Butler & Sepviva Streets, Philadelphia, Pa.**

•

Scotchcast Splicing Kit, a new four-page, illustrated booklet, contains instructions and application information for the No. 90-B1 splicing kit for underground cable and wire. The booklet describes the advantages of tailor-made Y splices which can be made in the field with ease and features step-by-step instructions for using the kit. The kit finds useful service in cathodic-protection ground-bed splicing. Also included in the booklet is an explanation of how electrical-insulating resin functions in

LOOKING FOR A WAY TO CUT COSTS ON PRODUCTION PUMPING?
SEE PAGE 163

KRAFTBILT
OIL INDUSTRY FILING EQUIPMENT



ELECTRIC LOG CABINET
E-28

Each drawer of Kraftbilt Model E-28 will hold 600 half-size or reduced electric well logs filed on edge. Drawers are equipped with five steel dividers which move in ½ inch slots to provide large or small filing sections. All-steel construction.

Strip Log Cabinet G-34, G-36

Horizontal Rollfile H-342

Filing Supplies to fit perfectly are available for all KRAFTBILT units.

Write for Catalog 656-B on Kraftbilt

ROSS-MARTIN COMPANY
P. O. BOX 800 TULSA 1, OKLAHOMA

MOBILBEAD

(FORMERLY SOVABEAD)

Soaks Up Moisture Twice As Fast

Nearly doubles your dehydrator efficiency!

- Maintains efficiency at temperatures as high as 120°F.
- Provides longer desiccant bed life.
- Eliminates caking, reduces channeling, dusting and pressure drops.

Ask Your Socony Mobil Representative About Mobilbead

SOCONY MOBIL

SOCONY MOBIL

Process Products

SOCONY MOBIL OIL COMPANY, INC.

26 Broadway, New York 4, N. Y., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

poured splices and how the Unipak container is used. A chart outlining the average electrical and physical properties of the epoxy resin is included showing how it meets the requirements of a moistureproof splice protecting material. **For more information write or call: Minnesota Mining & Manufacturing Co., 909 Fauquier Street, St. Paul 6, Minn.**

•

Wirth Slush Pumps, Conductor Pumps, and Cementing Pumps are covered in a two-color, 12-page booklet. It describes six models of double-acting twin-piston pumps; two models of double-acting single-piston pumps; and two duplex steam pumps. The booklet presents tables for each of the pumps listing sizes, cylinder diameter, r.p.m., and working data as well as a photograph. Two pages give closeup pictures of features such as the drive shaft, helical toothing and the mud drum. **For more information write or call: Alfred Wirth & Co., Erkelenz (RHLD), Germany.**

•

Allis-Chalmers Induction Motors, a six-page, loose-leaf catalog insert, covers large two-pole squirrel cage induction motors. These motors, 900 hp. and larger, meet requirements of today's high-speed drives. Construction details typical of the motor given in the Bulletin 05B8123A include a description of its spiral ventilation system which has proved so successful in large steam turbine generators, and of measures taken to achieve quiet operation in these high-speed machines. The bulletin employs photographs and cutaway drawings. The motors are particularly adapted for boiler-feed pumps, pipeline pumps, centrifugal blowers, and descaling pumps. **For more information write or call: Allis-Chalmers Manufacturing Co., 1059 South Seventieth Street, Milwaukee, Wis.**

•

The Insley Pipeliner Excavator-Crane is described in this new six-page, two-color Catalog PL-500. It presents detail photographs, action pictures, and general specifications. A table lists lifting capacities for the different boom lengths. Another table gives backhoe information. **For more information write or call: Insley Manufacturing Corp., Indianapolis 6, Ind.**

•

Alamask Odor Control for the Petroleum Industry. This six-page booklet presents data based on practical tests within the refining fields. It describes products which are specially designed aromatic chemicals, compounded to

Photograph by permission of British Petroleum Co. Ltd.

Better Protection at Less Cost

International paints, used by oil companies throughout the world, not only give full protection, they save money, time and labor as well.

With each International product specially 'tailored' for its particular job, maximum protection is given against sun, sand, salt air, moisture and all atmospheric and industrial pollution.

Highly durable, International paints cut costs by reducing the necessity for frequent re-painting . . . . . easy to work they cut down painting time and save labor costs . . . . . quick-drying they ensure that production is not held up.

For maximum protection at minimum cost — always specify INTERNATIONAL.

If you have not received a copy of "Paints for the Oil Industry" we shall be glad to hear from you.

International Paints

A World-wide Paint Organization with 23 factories throughout the World.

NEW YORK:
INTERNATIONAL PAINT CO., INC.,
21 WEST STREET, NEW YORK 6, N.Y.

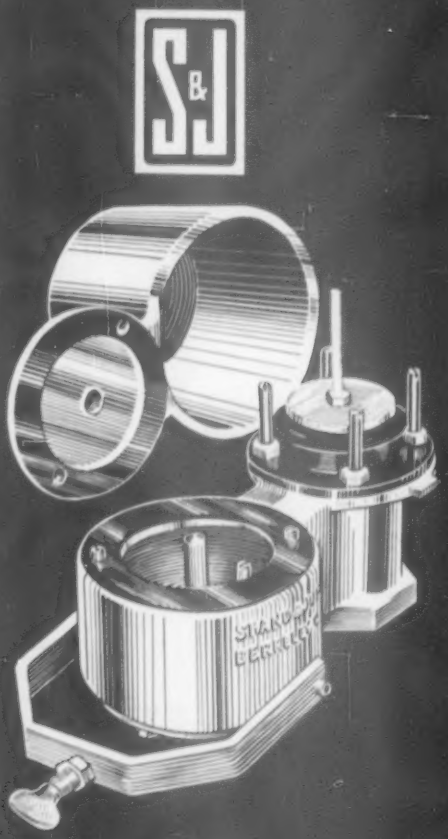
MONTREAL:
INTERNATIONAL PAINTS (CANADA) LTD.,
6709 PARK AVENUE, MONTREAL.

INTERNATIONAL PAINTS (EXPORTS) LTD.
GROSVENOR GARDENS HOUSE,
LONDON S.W.1. ENGLAND

Instant Accessibility

THE Shand & Jurs breather valve for bulk plant storage tanks provides maximum accessibility to working parts for inspection and cleaning. The vacuum and pressure covers are cast in one unit, and this single cover is held in place on the S&J breather valve by one thumb screw mounted on a swinging yoke. Just a few turns of the thumb screw and the cover is instantly removed, exposing both valves to view.

This S&J breather valve, designated Fig. ST-3695R, is available in 2", 3" and 4" sizes, and has been carefully engineered to give the greatest possible flow capacity. The corrosive resistant construction of the breather valve utilizes valve pallets and pallet seats of thermo-setting molded phenolic. This construction provides greater resistance to shock and corrosion damage, and will assure increased dependability even under the most severe operating conditions. Contact the factory or nearest branch listed below for additional information on the S&J breather valves for bulk storage tanks.



Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
110 E. 42nd St.

HOUSTON
M & M Bldg.

TULSA
Thompson Bldg.

CHICAGO
10409 S. Western Ave.

LOS ANGELES
6399 Wilshire Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St., W.
TORONTO: Lytle Engineering Specialties, Ltd., 69 Eglinton East
VANCOUVER: P. D. McLaren & Son, Ltd., 2277 Main Street
CALGARY: P. D. McLaren & Son, Ltd., 510 - 9th Ave. W.
MEXICO, D.F.: Dalmo Comercial, S. A.
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 28 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

provide the maximum in nonobjectionable odor coverage of malodorous materials which may be present in a petroleum product or may become air-borne during processing. The brochure lists the various sources of objectionable odors in petroleum processing and products and recommends specific odor-control chemicals to use. **For more information write or call: Rhodia, Inc. 60 East Fifty-sixth Street, New York 22, N. Y.**

•

Podbielniak Chromacons Analyze Petroleum from Hydrogen to Lubricating Oils, an eight-page foldout, features three series of analyzing instruments. Two of the series 9400 and 9475 each contain six models which are applicable to the qualitative and quantitative analyses of certain gases, low-boiling liquids, or high-boiling liquids. The third series, Chromacon Series 9485, is available in two models and analyzes a continuous gaseous or liquid process stream. This series is designed for field-processing plants, refineries, and petrochemical plants. Two-color foldout also covers other combinations of instruments for high-temperature distillation. **For more information write or call: Podbielniak, Inc., 341 East Ohio Street, Chicago 11, Ill.**

•

Carbon Brushes and Commutator Maintenance Team Up to Work for You, a new pocket-size booklet, is written as a guide for the maintenance man in solving his commutation problems. The 27-page Booklet B-6150-A is divided into three sections: maintenance requirements; factors affecting procedures for performing brush and commutator maintenance, and is illustrated with photographs and drawings. **For more information write or call: Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.**

•

Detroit Diesel Generator Sets presents a line of electric generator sets. The new 3-color, 24-page brochure includes specifications and illustrations of over 25 radiator and heat exchanger-cooled models ranging from 20 to 245 kw. Both 50 and 60-cycle and d.c. units for emergency standby and continuous off-the-line use are represented. Features of the two-cycle engines which operate the sets and automatic starting and shut-down equipment are fully covered. Photographs, specifications, and cutaway drawings impart detailed information on the equipment. **For more information write or call: Detroit Diesel Engine Division, General Motors Corp., 13400 West Outer Drive, Detroit 28, Mich.**

"Wherever there's oil you'll find Baird products on the job."

ALWAYS AVAILABLE THROUGH YOUR SUPPLY STORE

Baird MANUFACTURING COMPANY P. O. Box 380 TULSA, OKLAHOMA

CLEANOUT TAPS and DIES by BAIRD

SLUSH PUMPS — for ... piston rods, cross heads, valve cover and head studs.

SUCKER RODS — for ... all API and old style rods.

TUBING — for ... tubing 2 in. to 4 in. plain or EUE — round or V-threads.

Always tops in Quality-now IMPROVED to meet the demands of faster, deeper drilling!

Jimmie Gray EXCLUSIVE 500 TON SPECIAL IMPROVED JOINT COMPOUND

LOOK for RED ARROWS

Used Exclusively On World's Deepest Well In Louisiana!

60% METALLIC ZINC KANT-GALL TOOL JOINT COMPOUND

Sold through your favorite supply store

METALLIC STAR LONG-LIFE TOOL COLLAR COMPOUND

MONEY BACK GUARANTEE

USE JIMMIE GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING COMPANY

Here's your "Task Force" for any type of fire

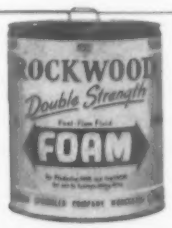
Complete team of Rockwood portable products combines speed, versatility and economy

Separately, each of these Rockwood products has its own particular advantages for fighting various types of fires. Together, they make a mobile, multi-purpose task force that delivers a whale of a lot of protection against *any* type of fire, whether it's Class A (wood, paper, rags, etc.), or Class B (flammable liquids). That includes personnel protection, too, because safety for the men who use them is an essential factor in all Rockwood fire fighting products.

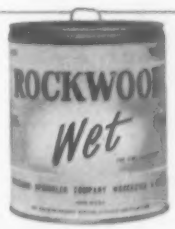
Rockwood's long, practical experience and constant research bring you not only new *efficiency* but new *economy* in fire-fighting methods and equipment. It will pay you to learn more about these and many other Rockwood products. Mail the coupon today for complete information on Rockwood's specialized fire-fighting products.

* **Type SG-60 Nozzle.** A true all-purpose nozzle that fights fire 5 ways. It discharges high velocity WaterFOG, low velocity WaterFOG (with applicator), FogFOAM, solid stream of water or solid stream of FOAM.

FOAM and "Wet" Eductor with the new FW Metering-Check Valve. Introduces Rockwood FOAM or "Wet" into hose lines, automatically proportioning correct amount of FOAM and "Wet" to water. Also usable wherever one liquid is fed into another on a fixed percentage basis.

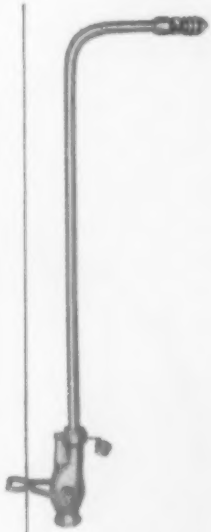


* **Rockwood Double Strength FOAM.** Puts out fires in flammable liquids, and in ordinary combustibles, quicker, at lower cost. Three parts FOAM and 97 parts water create a tremendous heat-resistant blanket. Flows freely at —15°F.



* **Rockwood WET.** One part WET mixed with 99 parts water increases water's penetration and extinguishing action. Gives quickest results against deep seated fires. Saves time, water, manpower.

Bayonet Piercing Applicator. Has a hardened steel cutting tool attached to tip, enabling operator to pierce through partitions, into interiors, etc. Discharges low velocity WaterFOG or FogFOAM.



* **Long Extension Applicator.** Discharges low velocity WaterFOG in an umbrella pattern, smothering fire without causing turbulence to flammables. Excellent personnel protection is another advantage.

FF Extension Unit. Shown with Type SG-60 Nozzle. Discharges Rockwood FOAM in a solid stream or as FogFOAM. Wide angle makes it possible to cover large areas at one time.

**NOTE: The products shown here have all been Tested and Listed by Underwriters' Laboratories, Inc.*

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1585 Harlow Street
Worcester 5, Mass.

Please send me your illustrated booklet on Rockwood fire-fighting products.

Name_____

Title_____

Company_____

Street_____

City_____

Zone_____ State_____

Alumalife® Case

Phenol Case

Why do ASHCROFT DURAGAUGE CASES increase service life?

Duragauge casings add extra-long service life to Duragauges because they're available in three different materials: you can choose the case-material that stands up best in *your application*. You have a choice of *Alumalife*® – a special aluminum alloy; *Cast Iron*, rugged and durable; and *Phenol*, a tough, rigid plastic.

Duragauge casings are dust and moistureproof. Chrome-plated, die-cast retaining rings keep the dial cover glass tightly in position and prevent the entrance of dirt or harmful fumes. Depending upon material, casings are Bonderized and the ring is Anodized and dichromate sealed for protection from corrosion.

For added protection, there is the Maxisafe Duragauge casing with a solid front – a special design for maximum safety and ease of maintenance. Duragauges are easy to service since Duragauge casings are constructed so that the entire system – socket, tube, tip, movement, dial and pointer – can easily be removed as a unit.

Lifetime Duragauge cases are available for numerous dial sizes. You have a choice of Bourdon tube materials, a wide range of pressures, and a movement made completely of stainless steel or stainless steel with nylon bearings and pinion gear.

Whatever case material and gauge system is best for your needs, you can rely on the Ashcroft Duragauge for highest sustained accuracy and long service life.

FOR PROMPT ASSISTANCE in selecting the right Ashcroft Duragauges for your specific needs, depend on the experience of your Industrial Supply Distributor. He is as close as your telephone.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

ASHCROFT GAUGES

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONNECTICUT

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Okla.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

G4-56

EQUIPMENT MEN . . . in the News

Johnston Testers, Ltd., Promotes Curley and Bruce

The promotions of Frank J. Curley to vice president and resident manager, and John E. Bruce to service manager for Johnston Testers, Ltd., have been announced by President M. O. Johnston. Johnston Testers in Canada is now managed locally and manned completely by Canadian personnel.

F. J. CURLEY

J. E. BRUCE

Curley formerly was sales manager, having joined the company in 1951. His first assignment was in the service department, and he moved from there into the sales section. Prior to joining Johnston, he had worked as a roughneck and as a service engineer for drilling contractors, producing companies and a service company.

Bruce, formerly district manager in Regina, joined Johnston in 1951 as a service man in Edmonton after being associated with Imperial Oil. Since that time he has worked in all active areas in Canada.

Macwhyte Appoints Whyte As Field Sales Manager

Russell J. Whyte has been appointed field sales manager for Macwhyte Co., Kenosha, Wis. He will be responsible for all field sales activities and for distributor and customer relations conducted from Kenosha.

Whyte for the past 12 years has been a district factory representative in California, and prior to this was employed by Macwhyte Co. in product-engineering work. In all, he has 21 years of service with the company.

Bethlehem Announces Personnel Changes

R. E. Ligon has been promoted by Bethlehem Supply Co. to store manager and field representative at Sweetwater, Tex.; E. T. Broughton, machinery sales representative for the Kansas district, has been transferred from Great Bend to the Wichita district office; and the duties of W. A. Nestlerode, special representative at Denver, have been broadened.

Ligon formerly was field representative at Sweetwater. Nestlerode's work will cover all production sales problems in the Rocky Mountain district. He will continue to base at Denver but will be available for engineering service on water flood and related projects throughout the district.

BJ Service, Inc. and Chemical Process Combine

BJ Service, Inc. and Chemical Process Co., of Breckenridge, Tex., have combined their oil-well service operations. The announcement was made jointly by John B. Merritt, executive vice president of BJ Service, and R. G. Miller, executive vice president of Chemical Process.

All assets of Chemical Process were acquired by Borg-Warner Corp. BJ Service is the oil-well service organization in the Byron Jackson Division of Borg-Warner. R. C. Ingersoll, chairman of the board of Borg-Warner, stated that this acquisition is another major step in Borg-Warner's programmed expansion in the petroleum industry.

Two major laboratories at Breckenridge and Long Beach, Calif., will coordinate development projects on oil-well service techniques and new service tools and equipment.

BJ Service provides oil-well cementing, well perforating and related services in California and Rocky Mountain areas and performs cementing services in the Permian basin area of West Texas and New Mexico. Chemical Process specializes in fracturing, acidizing and permeability meter surveys and operates in Texas, Oklahoma, Louisiana, Kansas and New Mexico.

John B. Merritt, BJ Service, and R. G. Miller, Chemical Process, shake hands as the two companies combine their service operations.

Beacon Personnel Changes Made in Texas, New Mexico

T. S. Brown has been transferred to Pampa, Tex., as manager for Beacon Supply Co.; B. B. Phillips replaces Brown as store manager at Farmington, N. M.

W. F. Woodmore has been appointed field representative for Beacon in Borger, Tex. R. A. Thompson is a new pump repairman at the Borger store, replacing Rosco Buster Bundick, Jr., who has been transferred to Pampa in the same capacity.

Dale Shackelford, formerly floorman at Pampa, has been transferred to Farmington as field representative. James W. Bush is new floorman at the Pampa store.

Westinghouse Air Brake Appoints Holbrook

E. L. HOLBROOK

The appointment of E. L. Holbrook as sales manager of Westinghouse Air Brake Co.'s industrial products division has been announced by A. J. Bent, division director. Holbrook, who joined Westinghouse in 1929, has been in Europe for the last 2 years assisting Westinghouse's associated companies introduce pneumatic controls and devices to the European industrial, construction and marine markets. Prior to his European assignment, Holbrook directed the operations of the industrial products division's Washington, D. C., office for 10 years.

Hopas Retires as Newalls Overseas Superintendent

A. J. Hopas, who for 30 years was concerned with the development of the export business of Newalls Insulation Co., Ltd., has retired from service. As export manager, Hopas traveled throughout world markets and as general overseas superintendent continued to make trips abroad on behalf of Washington Chemical Co., Ltd., and Newalls Insulation.

The export activities of Newalls Insulation continue in charge of A. E. Adams, export manager. The program of foreign travel will be carried out

by T. W. Stuart, overseas marketing manager. He will be specially concerned with the direct sale of Newalls' materials through overseas representatives and distributors.

Two Candian Store Managers Named by Oilwell

The appointment of Joseph G. Walsh as manager of the U. S. Steel Corp., Oil Well Supply Division, store at Dawson Creek, B. C., and the transfer of John H. Hudson, store manager, from Swift Current, Sask., to Estevan, Sask., have been announced by W. A. Weir, manager of Oilwell's Canadian area.

Walsh was employed in 1952 at Edmonton, Alta., and in 1955 was transferred to Virden, Man. In January 1956 he was appointed field representative at Estevan, the position he held prior to his new appointment.

Employed at Swift Current in 1952, Hudson was transferred to Calgary in 1954. In 1956 he was appointed manager of the Swift Current store.

Sullivan Named Division Engineer by Schlumberger

Charles L. Sullivan, Jr., has been made division engineer for Schlumberger Well Surveying Corp.'s North Central Texas division. He will be stationed at Abilene, Tex.

Sullivan's duties will involve the training of division personnel in the maintenance and operation of the more complex surveying instruments.

Petroleum Specialty Names General Manager

FRED NIEMEIER

Fred Niemeier has been named general manager of Petroleum Specialty Co., makers of Crall Spiral paraffin scrapers. The appointment was recently announced by A. E. Hickman, president of the company. Niemeier will be located in the company's general offices, Pampa, Tex.

Niemeier joined Petroleum Specialty in 1948 as a sales representative in the Texas Panhandle. In 1951 he was appointed Rocky Mountain division and western Canada sales manager. His new duties include responsibility for the company's 8 plants and 13 sales offices. The company recently opened a new Canadian plant in Red Deer, Alta.

Sales Forum Attended by Wheatley Representatives

Convening recently in Tulsa were the midwestern and southwestern field representatives of Frank Wheatley Pump & Valve Manufacturer. The regional sales engineers participated in forum discussions with the company's sales and manufacturing officials regarding area sales policies.

Shown at the Wheatley display room are (back row): Huber Dye, manager of the affiliated Frank Wheatley Supply Co.; Ray Hardy, representative from Iola, Kans.; George Blain, representative, Fort Morgan, Colo.; Orbie Sumner, service manager, FW Manufacturer; R. V. Hackenjos, representative, Houston; John Barsalow, general superintendent, FW Manufacturer.

Front row: Bob Fisher, general manager, FW Manufacturer; Gus Baker, Jr., vice president, FW Supply; Frank Wheatley, Jr., president of both companies; and Cliff Emberton, representative, St. Elmo, Ill.

Wheatley said similar meetings will shortly be held with representatives from Wheatley Equipment & Supply Co., Ltd., Edmonton and Alberta, Canada, and Frank Wheatley Supply Co. of Bartlesville, Houston, Shreveport, and Odessa.

Snyder and Garrett Speak Before Houston Group

J. I. SNYDER, JR.

John I. Snyder, Jr. president and chairman of the board of U. S. Industries, Inc., recently spoke in Houston before a group of 100 oil men and bankers. Another principal speaker at the meeting was H. U. Garrett, president of Garrett Oil Tools of Houston and Longview, Tex.

Snyder spoke of the possibility of a multimillion-dollar research laboratory, with Houston being considered as its location. Garrett reviewed the growth of Garrett Oil Tools and its becoming a part of U. S. Industries.

U. S. Industries has 13 plants and is active in the fields of oil-field production equipment; water pumping, transmission and treatment equipment; and metal-fabricating equipment.

Snyder became president and chairman of the board of U. S. Industries in 1948.

White Names Gosden as Gulf Coast Representative

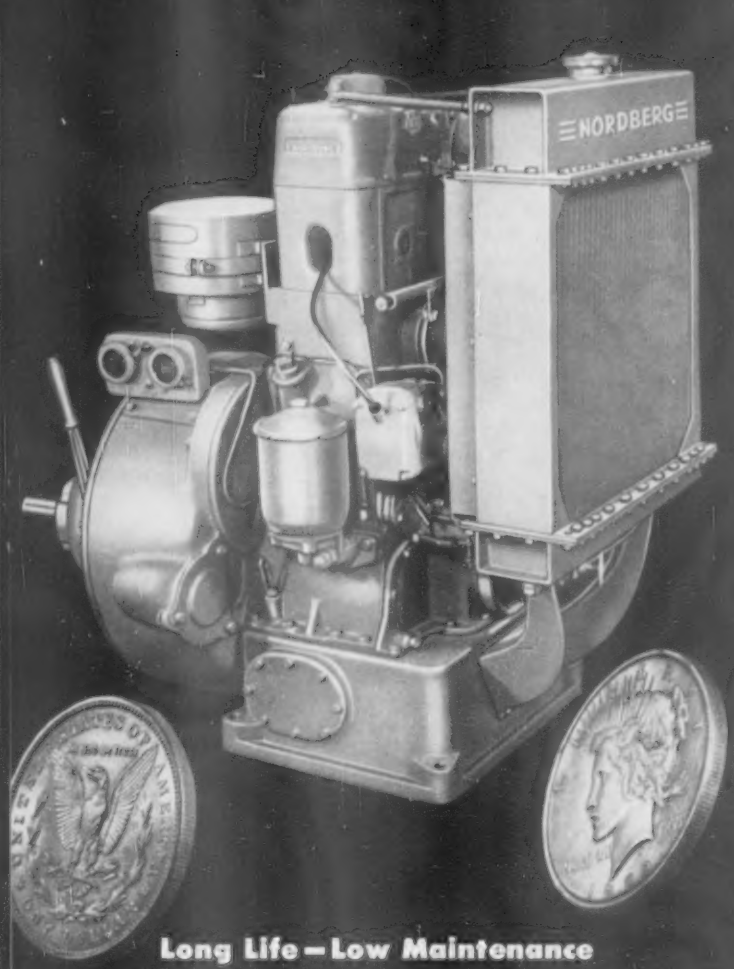
The appointment of Louis A. Gosden as Gulf Coast representative was recently announced by White Diesel Engine Division of White Motor Co.

General Manager William F. Burrows of White Diesel said Gosden will have headquarters at the division's Houston branch office. He will handle sales and service of gas and diesel engines and diesel electric drilling-rig units.

Gosden previously was a sales engineer for Emsco Manufacturing Co. and was in rig sales and service with Wilson Manufacturing Co.

Beaird, Dellone Named J&L Store Managers

Jack A. Beaird, formerly at Sherman, Tex., has been transferred to Tulsa as local store manager of the central ware-



DOLLAR FOR DOLLAR...

NORDBERG

POWER CHIEF®

ENGINES

are your Best Buy for Oil Field Service

Long Life—Low Maintenance

These two important factors in the long run justify the soundness of your original investment in oil field pumping engines.

Before you buy your next engine consider the many service histories of Nordberg *Power Chief* engines that show over 30,000 hours of continuous pumping operation, with the original rings, pistons, liners, bearings and crankshaft still in place . . . this is real proof of value received for dollar invested.

Add to this the many "extras" such as enclosed clutch power take off and safety shut down control that are included as standard equipment on *Power Chief* engines and you will see why you save by specifying *NORDBERG*.

NORDBERG MFG. CO., MILWAUKEE, WIS.

CONDENSED SPECIFICATIONS

	ONE CYLINDER	TWO CYLINDER
Bore & Stroke	4½" x 5¼"	4½" x 5¼"
Piston Displ	83.5 cu. in.	167 cu. in.
Compression Ratio	6 to 1	6 to 1
Speed Range	800 to 1800 rpm	800 to 1800 rpm
Horsepower	18 hp. max.	36 hp. max.

For complete specifications and literature, mail the coupon today.

NORDBERG

DIESEL • DUAFUEL® AND SPARK IGNITION GAS ENGINES

Available at your local Supply Store or contact these Authorized Distributers:
SOUTHERN ILLINOIS—Stephens Oil Field Repair, Fairfield, Illinois
KANSAS—Mead Engine & Welding Works, Sterling, Kansas
OKLAHOMA—Cornelison Engine Maintenance Co., Inc., Seminole, Oklahoma
HOUSTON & GULF COAST—Diesel Engine & Equip. Service Co., Houston, Texas
LOUISIANA & MISSISSIPPI—Rogers Diesel Engineering Co., New Orleans, La.
WILLISTON—Tractor & Equip. Co., Sydney, Montana
COLORADO—JULESBURG—Mead Engine & Welding Works, Sterling, Colorado
SOUTHERN CALIFORNIA—In-Mar Co., Wilmington, California

MAIL THIS COUPON TODAY

Nordberg Mfg. Co., Milwaukee, Wisconsin

Send specifications sheets on Nordberg *Power Chief* engines to:

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

© 1956, Nordberg Mfg. Co. 4-456-0

Frank Watts, left, veteran store manager for an independent distributor, having a branch at Bay City, Tex., and H. P. (Pat) McGuirt, tool pusher for Otis Russell Drilling Co., watch Pittsburgh Seamless casing being unloaded at a rig near Damon, Tex.

Santa Claus Must Wait When Oil Field Emergency Arises

Here's Why You Can Rely On Pittsburgh Steel's Independent Distributors

It's shortly after midnight as Frank loads a swedge from his store for delivery to the Damon well.

Once he's at the well, Frank sits down in the bunk house with Mr. McGuirt to go over an order for delivery the next day.

'Twas the Night Before Christmas in Bay City, Texas, as Frank Watts, his wife and their children retired for the night.

A few hours later—4 a.m., to be exact—Frank was awakened—not by Santa Claus and his reindeer, but by a telephone call from a driller 35 miles away.

Due to an unavoidable incident a small valve was needed immediately.

Because Frank Watts is a veteran supply man and manager of an independent supply company store (representing Pittsburgh Steel Company) in Bay City, he knew the importance of the driller's call. Holding up drilling costs money, whether it's Christmas morning or the 23rd of July.

Frank was on his way quickly, opened the store, got the valve, delivered it and made it back home in time to watch the kids open their gifts at 8 a.m.

This was not an unusual event as his wife recalls any number of times when Frank has shown up at dawn due to similar emergencies. For example, there was the night when he made a round trip to Houston (180 miles) for $12.00 worth of parts he was temporarily out of and which were badly needed on a rig.

At 36, Frank Watts is a tall, raw-boned, friendly man the movies would cast as a typical Texan. But more important, he's an oil field businessman, a representative of one of the 18 independent distributors (listed at right) handling Pittsburgh Seamless. And he has nearly 15 years of experience under his belt.

He is accustomed to working 65 hours a week and it doesn't bother him to get frequent night calls, half of them to open his store so a driller can get an item he needs, the other times an SOS for delivery of supplies to keep a drilling operation going.

Frank Watts has "service" as his first and strongest business byword. Quality of the products he handles is a close second. As he puts it:

"I learned a long time ago that service and the best products available are the keys to profit and success in this supply business.

"If we handle only good quality stuff, proven material the men at

An oilman's assurance of quality—Pittsburgh Seamless—is the topic of this conversation Frank is holding at the well-site.

Frank watches cat-heading of Pittsburgh casing as it is run into hole. Frank's company handles a full range of Pittsburgh Drill Pipe, casing and tubing.

the rigs can rely on, and give them all the service they need, we'll get their business and we'll keep it."

Those words stand as testimony to the quality of Pittsburgh Steel Company's drill pipe, casing and tubing. The company Frank works for handles only Pittsburgh drill pipe, although it offers several manufacturers' casing and tubing.

They prove, too, why the independent supply house has become such a vital force in the oil and gas fields.

Independent distributors are ready for action around the clock. Frank's store stocks nearly 3,000 different items ready for delay-free normal operation or for emergencies.

An independent distributor's service is flexible. The independents are personal friends to the oil men they serve. Through their long experience, they know the problems oil men face and can meet their requirements without red tape and extra paper work. They are free from remote control and can make big decisions without wasting time. The independent store is usually the first in an oil field and the last to leave, if it ever does. Its personnel live in the area their stores serve. Their own personal futures are tied to the success they generate for themselves.

Independent distributors help keep costs low. Though they specialize in service, their prices are competitive. Their livelihood depends on meeting competition. Almost with no exception, the independent's representative will stay in the area of his store, not move on every couple of years. The money the independent makes stays where he makes it.

The independent offers only the best in equipment because he buys only what he wants to buy. He is free to select from the best equipment made. Pittsburgh Steel and all the other reputable manufacturers back up the independent distributor.

Independents are the most accessible suppliers in the oil fields. For example, Pittsburgh Steel's distributors have a total of 140 stores in all parts of the oil and gas fields.

Next time you buy drill pipe, casing or tubing use the team that can't be beat: Pittsburgh Seamless and your independent distributor.

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Columbus	Detroit	New York	Tulsa
Chicago	Dallas	Houston	Philadelphia	Warren, Ohio
Cleveland	Dayton	Los Angeles	Pittsburgh	

Distributor Home Offices

Bradford Supply Company
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

house of Jones & Laughlin Supply Division, and T. P. Dellone has been appointed to succeed Beaird as local store manager at Sherman. These changes have been announced by A. G. Bastian, manager, field sales division.

Beaird has been with J&L Supply since 1945 having served as a storeman at Odessa, Tex., and Oklahoma City and as store manager at Healdton and Duncan, Okla., and at Sherman.

Dellone, formerly a storeman at Sherman, joined J&L's Bolivar, N. Y., store force in 1940. With the exception of a military leave, he remained at that location until his transfer to Sherman in October 1955.

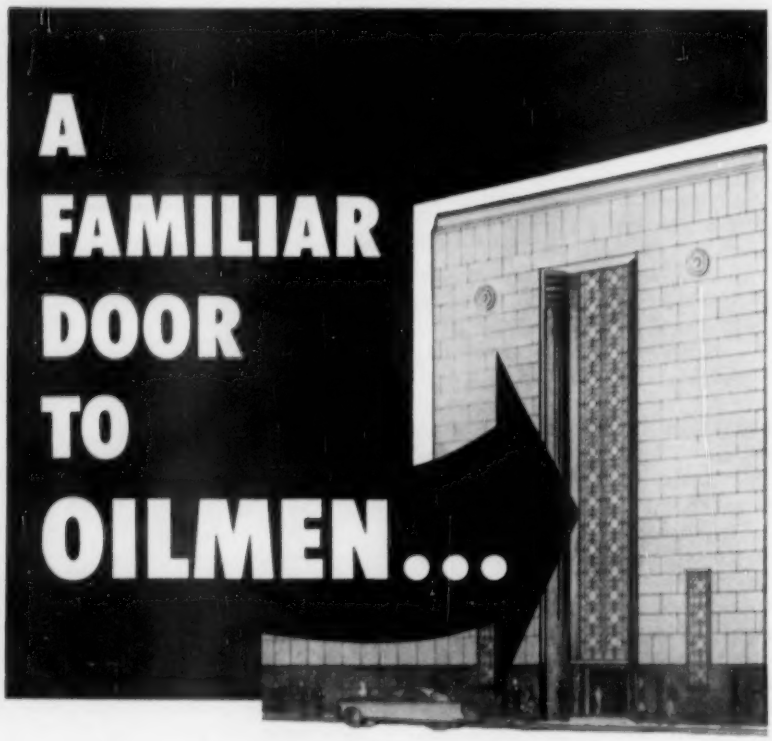
Schlumberger Makes Sales, Managerial Appointments

Lee Petty has been promoted by Schlumberger Well Surveying Corp. to division sales engineer at Corpus Christi, Tex.; Carter Robinson has been named field sales engineer in Houston; C. Wayne Millis has been transferred to Farmington, N. M., where he will be district manager; Gale T. Bradshaw is the new district manager at Liberal, Kans.

F. D. Fulkerson has been named district manager at Kermit, Tex. H. T. Carson leaves his former position as division engineer at Corpus Christi to become district manager at Falfurrias, Tex. The new Alice, Tex., district manager is Floyd A. Rice.

In Saskatchewan H. N. Collins is now location manager at Estevan. D. W. Patterson has taken over the Swift Current location, and J. T. Wilson is now in charge at Oxbow.

Formerly location manager at Edmonton, P. Charles is moving to Calgary as an assistant to the area manager. W. J. Monkman will take his place as location manager in Edmonton.



It's the door to Victoria Bank and Trust Company, of course; a door widely used by oil men who rely on our Oil and Gas Department to solve their financing or investment problems.

For a bank with specific knowledge and facilities to meet your needs, consult the Texas' Golden Gulf Coast oil bank . . .

Organization of Crescent Oil Well Supply Announced

A. Rex Watkinson, Jr. has announced the formation of a new oil-field equipment company to be known as Crescent Oil Well Supply Co. Main offices will be located in the Atlas Building, Tulsa.

Watkinson is president and general manager of the company. George Coleman, Jr. has been appointed store manager and sales representative for the Okemah, Okla., store.

Crescent Oil Well Supply will handle all types of oil-field and rotary equipment.

Neale Added to Peerless Manufacturing Sales Dept.

William M. Neale has joined the sales department of Peerless Manufacturing Co. of Dallas, according to Donald A. Sillers, executive vice president of the company.

Neale will serve out of the company's headquarters in Dallas handling sales on all Peerless products, plus Sillers Engineering Co. Flex Ring closures. Neale formerly was associated with Phillips Petroleum Co. serving in a variety of engineering and refinery-operation assignments.

Oilwell Names Campbell to Production Equipment Post

The appointment of Thomas L. Campbell as assistant manager, production equipment sales, Long Beach, Calif., has been announced by D. S. Grubbs, California area manager for U. S. Steel Corp.'s Oil Well Supply Division.

Campbell served Oilwell from 1937 to 1942. He returned to the division in 1952 as assistant district manager at Long Beach. In 1955 he was appointed assistant tubular manager at Los Angeles, the position he held prior to his recent appointment.

550,000 MILES

—Not a single mechanical failure!

S. S. United States, world's fastest passenger liner, 100% Mobil Lubricated!

162 times across the Atlantic . . . almost four years of continuous service . . . highest average speed of any passenger liner—30.6 knots between Ambrose Light and Bishop's Rock—*and never once a slowdown due to mechanical wear or failure!* That's the impressive performance record achieved by the S. S. United States, Atlantic Blue Ribbon winner.

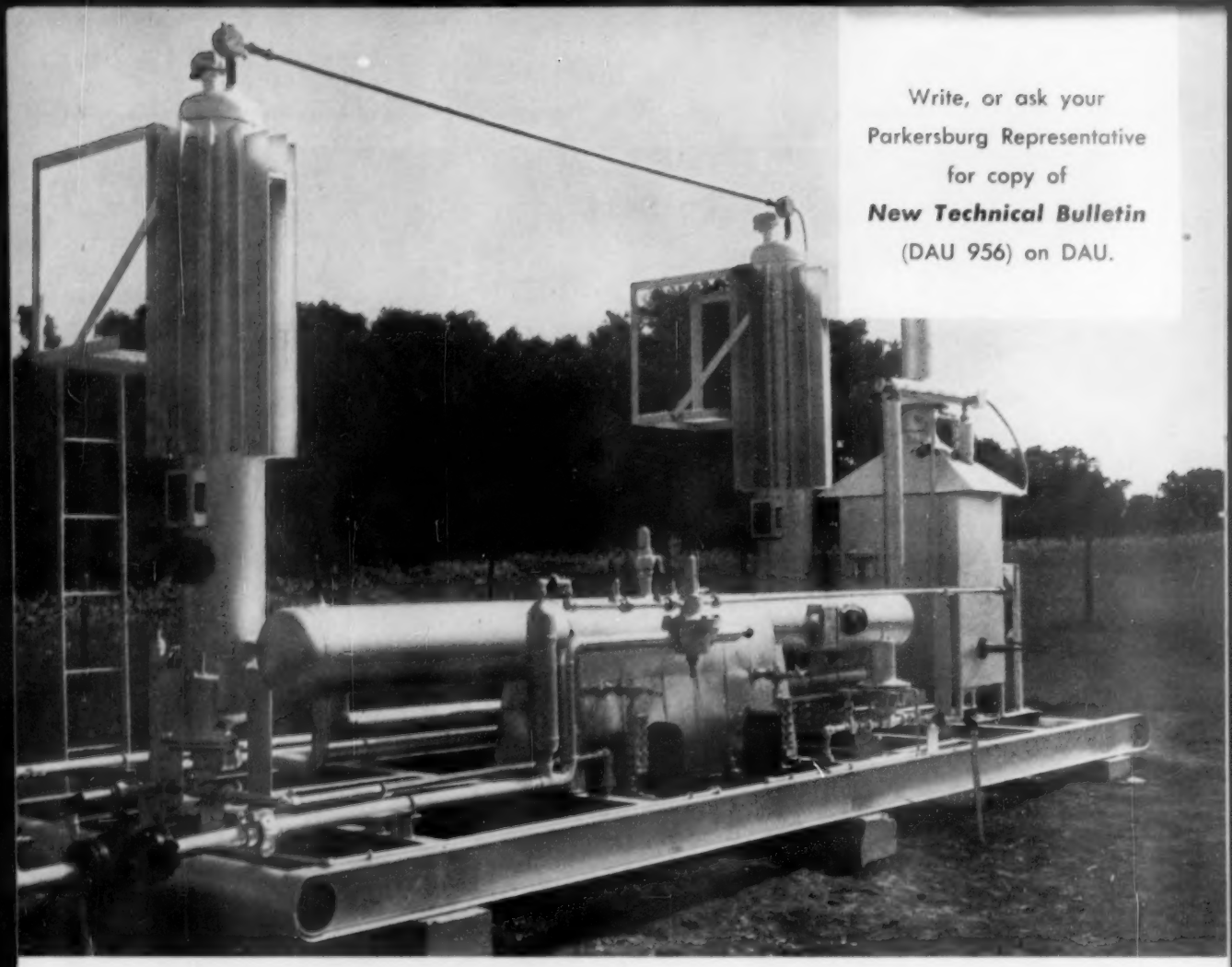
Since her maiden voyage in July, 1952, the giant liner has protected her main engines and auxiliaries through more than 20,000 hours of operation with world-famous Socony Mobil lubricants.

You can count on outstanding performance from your car with famous Mobil products. Stop at your Mobil dealer, for Mobilgas, Mobiloil and expert, friendly service.

SOCONY MOBIL OIL COMPANY, INC.

LEADER IN LUBRICATION FOR NEARLY A CENTURY

Affiliates: General Petroleum Corporation, Magnolia Petroleum Company



Write, or ask your Parkersburg Representative for copy of ***New Technical Bulletin*** (DAU 956) on DAU.

PARKERSBURG DAU WELDRIER

delivers greater dehydration efficiency -- requires ⅓ less desiccant -- uses 80% less fuel gas

Since the DAU was designed to take full advantage of the dynamics of the adsorption process, each particle of desiccant develops the maximum possible efficiency. This enables the DAU to dehydrate a high pressure gas stream with only a few hundred pounds of desiccant compared to several thousand pounds required by conventional dehydrators.

Moreover, regeneration of the desiccant packs requires only about 20% of the fuel gas normally required by ordinary dehydrators. The savings on desiccant and fuel gas alone amount to hundreds of dollars—more than enough to pay out the low first cost of the PARKERSBURG DAU WELDRIER in an unusually short time.

It will be worth your while to talk over the many advantages of the new DAU WELDRIER with your Parkersburg Representative.

Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

5630

1919

IMPERIAL PHOTO

1956

From intrepid trail blazer to A.A.P.G. president . . that's the

"Lucky Link" Story

by Frank J. Gardner

EVER teach an Eskimo to play checkers? Or name a river, or a batch of mountains? Or throw $35,000 in cash across the swirling rapids of a river?

This man did. And to hear him tell of his experiences is an adventure in itself. He is Dr. Theodore A. Link, genial president of the American Association of Petroleum Geologists. Most people call him "Ted," but he says that all his life he's been known as "Lucky" Link. To carry the name play a little further, right now he's serving as a very important link between Canadian and American oil finders. A native of the United States, most of his career has been devoted to Canadian exploration, and he considers himself a "Canerican" more than anything else.

A classified ad . . . In a hotel lobby in Cisco, Tex., early in 1919, Ted was pondering his future. As he thumbed through a copy of The Oil and Gas Journal, he saw an ad . . . "Geologist Wanted." He applied, got the job, and for the imposing sum of $240 a month, went to work for Imperial Oil, Ltd. He was to stay for 27 years. His first job was to explore the Northwest Territories along the treacherous Mackenzie River for possibilities of oil. To a less daring man, the assignment would have been a nightmare. But to Ted it was a challenge. And it was to bring him lasting fame.

He set out on the 1,100-mile journey in the spring of 1919. With him was his assistant, Jack Zieman, and a helper or two. They traveled by canoe, horseback, and on foot; it was the first time an oil hunter intent on drilling had invaded this wild country.

Link intended to drill. He spent many weeks making reconnaissance surveys along the Mackenzie. He named rivers, mountains, and geologic features that had never had names before—and many of those names still stand today (e.g., the Heluva River). He trudged the mountains and the valleys, fought the rapids, and played footsie with wolves, bears, and mosquitoes. But he found a likely spot at what is now Norman Wells.

A six-man drilling crew was to follow him from McMurray railhead to whatever drill site he selected; the rendezvous was set for late July. But delay after delay held up the drillers; it took 2 weeks to make the 300 miles to Fort Fitzgerald; 2 weeks more to unload and reload the tons of equipment they carried across 16 miles of bush country from Fort Fitzgerald to Fort Smith; and 2 weeks more to reach Fort Norman.

Meanwhile, Ted and Jack had run out of food. So they paddled 40 miles upstream in a canoe to meet the drilling boat. "Believe me," Ted says today, "food, even if it was beans and salt pork, never tasted so good as it did on that boat."

And a wave of the arm . . . Forty miles downstream, Link had selected the drill site. As soon as the equipment was ashore, he and Zieman headed for Fort Smith to record their claims. But before they left, the tool pusher asked where to drill. "Anywhere around here," shouted Link, waving his arm in an arc, and off to the south he went, not to return for nearly a year.

Make Norman Wells . . . When he did return, in July 1920, he brought along a relief drilling crew. And it's a good thing, for he found each of the six old-timers ready to do in any one or all of the others, after a long hard winter of isolation. They'd made only 300 ft. of hole by then, and Link went on 40 more miles downriver to look at other prospects. He'd just settled in camp when one of the new drillers came on the run from Norman Wells, panting the news that oil was bubbling up in the pipe. "Don't disturb me," Ted calmly replied, "until you see it gushing out!"

It gushed at 900 ft., and Imperial had opened a new oil frontier. The strike set off one of the wildest oil rushes of the time.

It was about this time that Ted Link became known as one who throws his money around. He was a passenger in a small plane as it crash-landed on the icy river at Fort Norman. In his briefcase was $35,000 in cash with which to buy claims from the Indians. Having heard that you can't take it with you, quick-thinker Link heaved mightily and crash-landed the cash on the bank—the river bank, that is. As he crawled from the wreckage, someone handed him the bag, and Lucky Link had done it again.

An incredible yarn . . . The incredible angle to this story is, that out of the 2 million square miles of Arctic territory to which he was assigned, Ted Link with a wave of his arm, spotted the one and only place in the Northwest Territories that has ever produced commercial oil; and that if he had drilled only a short distance from the spot he chose, he'd have missed the Norman Wells reef. Lucky? What do *you* think?

S. E. G. Will Hold Annual Convention in New Orleans

Here are abstracts from some of the papers to be presented at the twenty-sixth annual convention of the Society of Exploration Geophysicists

- **TIME:** October 29-November 1
- **PLACE:** New Orleans, La.
- **PROGRAM:** Presentation of more than 40 papers plus offshore field trips

The Part Played by Statistics In Exploration

FREDERIC H LAHEE, consulting geologist, Dallas.

IN the business of exploring for oil and gas there are many factors to be considered. Such are the cost of drilling (including accessibility, availability of materials, depth to expected pay, etc.) markets, probable size of reserves for profitable exploitation, legal restrictions, tax angle, regional geology, local geology and so on. To these, which are more commonly considered, should be added the statistical record.

Statistics imply the tabulation and comparison of accumulated classified data. Therefore, statistics cannot be applied until after there has been considerable experience in an area, but as soon as this condition has been reached, selection of areas for further exploration may well be guided by the statistical background of the past.

Geology and Geophysics Of the Gulf of Mexico

PAUL L. LYONS, Sinclair Oil & Gas Co., Tulsa.

INTEGRATION of the presently known geology and geophysics of the Gulf of Mexico assists in the eventual solution of the many problems of tectonics, sedimentation, and basin formation which are yet unanswered. The greatest problem is the geologic section existing in the central part of the Gulf basin. This large basin may be regarded as centering at the position of a great gravity maximum. Patterns of thrusting, graben structures, volcanic vents, salt basins, and tension faults are evident. Sedimentation has been controlled mainly by the ever-present Mississippi River, and sand distribution has been controlled by successive positions of the shore line and the river. A theory of origin and development is presented.

A Refraction Seismograph Procedure For Delineating Salt Domes

W. LEE MOORE, Petty Geophysical Engineering Co., San Antonio.

A METHOD is described whereby the depth and configuration of a salt dome can be determined by means of a network of surface-to-surface refraction profiles. A procedure using aplanatic curves in outlining the flanks of salt domes is also described. Typical records, charts and cross-sections illustrate the use of the methods in outlining an offshore salt dome.

Analysis of Offshore Domes From Gravity Surveys

L. L. NETTLETON, Gravity Meter Exploration Co., Houston.

THIS paper reviews the effectiveness of gravity surveys for determining shape and depth of offshore salt domes and is illustrated with gravity maps and cross-sections from two examples.

The San Luis Pass dome, about 10 miles offshore and between Freeport and Galveston was covered with a very detailed gravity survey of some 130 stations for the determination of the location, depth, and thickness of caprock in advance of drilling to evaluate the dome as a sulfur prospect. The gravity survey and its interpretation indicated a shallow dome and outlined a large area with moderate thickness of caprock. Subsequent drilling confirmed the geophysical indications quite satisfactorily.

A gravity survey of some 50 stations was made over the large topographic mound "Way," about 120 miles southeasterly from Galveston and near the edge of the Continental Shelf. The topography has relief of nearly 400 ft. with a small area reaching to a minimum depth of about 60 ft. The gravity shows a large circular minimum

Davis Selected for Principal Speaker

Morgan J. Davis, executive vice president and director in charge of the exploration department of Humble Oil & Refining Co., will be the principal speaker at the twenty-sixth annual convention of the Society of Exploration Geophysicists, October 29-November 1 at the Roosevelt Hotel, New Orleans, according to O. G. Holekamp, program chairman.

Davis has wide exploration experience in the United States and Far East. In his early days with Humble he was geologist in charge of the Roswell, N. M., office. In 1929 he joined Nederlandsche Koloniale Petroleum Mij. and supervised geological exploration in Java and Sumatra. He returned to Humble in 1934 as district geologist for New Mexico and 2 years later became division geologist for the Gulf Coast division. He was named a vice president in 1951.

Another outstanding feature of the convention program, Holekamp says, will be a field trip to observe airborne and water exploration operations in the Gulf of Mexico and the marshes of South Louisiana.

M. J. DAVIS

Holekamp said the technical sessions of the convention at which more than 40 papers will be read will cover the subjects: offshore exploration, instrumentation and research, foreign exploration, model studies, international geophysical year, economics, and case histories.

with an indefinite indication of a central maximum. Illustrations show the gravity results, the topography and a possible structural interpretation.

Future Offshore Oil Provinces of the World

DR. T. R. GOEDICKE, Offshore Exploration Group, Houston.

MODERN exploration techniques, including concentrated use of geophysics, are being applied with a great deal of success to the location and development of marine oil resources in the Gulf of Mexico. A ratio of one producer in two and one-half marine wells drilled in the Gulf has directed the attention of oil men to similar areas in the world, where large quantities of petroleum may lie beneath shallow seas. This interest is further enhanced by the fact that past experience has indicated that in undeveloped countries, exploitation of oil reserves at sea is less expensive than on land. A saving per unit area also is effected in marine seismic surveys. The next decade will see rapid development of exploration for offshore oil around the world. It is the purpose of this paper to outline the geology of some continental shelf areas which are situated near petroliferous sedimentary basins.

Some of the following areas are expected to be focal points of interest for exploration: In the Americas; the Gulf of Mexico and Caribbean coastal areas of Cuba, Central America and South America; also shelf areas off Ecuador and Peru. Europe and the Near East will see development along the Atlantic coast of France, on shelf areas in the Mediterranean and especially in the Persian Gulf. Exploration and development in Asia will be centered on the extended marine areas of the Indonesian Archipelago as well as on shelf areas along the coast of Pakistan, Iran, India, and Burma. Marine oil possibilities will also be investigated in the Philippines and along the west and northwest coast of Australia.

The Granite Wash in Western Canada

J. C. SPROULE, J. C. Sproule and Associates, Ltd., Calgary.

THIS paper presents a brief summary of the granite wash oil occurrences in western Canada as they are known today. The granite wash is defined lithologically and its age relationships to overlying and underlying rocks discussed, with particular reference to the possible origin, lithology, structure, paleotopography, and tectonic history of the underlying Precambrian surface, on which it depends for its occurrence and development as a reservoir. The anticipated future in western Canada of this reservoir, with particular reference to the part that should be played by geophysics, is also discussed.

The Gulf Seismic Profile Printer

E. M. PALMER, Gulf Research & Development Co, Pittsburgh.

A SEISMIC recording system has been developed in which seismic sections, printed photographically in variable-density form, simulate geologic cross-sections. The seismic signals recorded at geophone stations arranged for continuous reflection center-point control and presented in a sequence of vertical tracks. The tracks are adjusted for known corrections and reproduced at a selected horizontal scale. Prints of the variable-density section exhibit all events and their interrelationships for ready recognition and appraisal.

The printer mechanism reduces seismic information to a uniform time basis, with weathering and elevation corrections to datum, and with stepout corrections in which account is taken of changing wave-front velocity with vertical travel-path arrival time.

The original field records comprise variable-density tracks on strips of 70-mm. film. In the printer, the record tracks are simultaneously corrected and transferred to a continuous sheet of film by contact printing. Punched cards feed correction data to the mechanism which operates automatically, but with provision for various special automatic functions under control of the operator.

A Review of Pacific Coast Offshore Seismic Methods

CARL H. SAVIT, Western Geophysical Co., Van Nuys, Calif.

THE steep dips of California geology demand cross control at every shot point. This requirement determines almost all of the techniques used in Pacific Coast offshore work. Surveying methods have been devised to determine the exact configuration of each spread layout at the moment of detonation of the shot. Data reduction methods include dip resolution for each reflection and projection of the reflections into the plane of the cross-section. This procedure also facilitates the detection and identification of the many reflected refractions encountered.

Varying water depths produce problems ranging from wave-guide resonance to multiple reflections of high order. Computing and plotting techniques are designed to identify the multiple reflections and thus to distinguish them from the desired simple reflections.

Several records and a cross-section are presented to illustrate some of the problems discussed.

The Use of Gravity Surveys to Determine Possible Fault Trends

LAWRENCE S. MORRISON, Humble Oil & Refining Co., Los Angeles.

IT is generally believed that most of the large simple anticlines in oil-producing areas of the United States have been found. This implies that the search for more complex types of traps such as fault traps will become more intense. Often times, faults are associated with density contrasts across them great enough to be detected with a gravity-meter survey. This brings up the question of how can we recognize the possibility of faulting on a Bouguer gravity map.

Examples of gravity surveys over known faults are compared with hyperthetical fault superimposed on an assumed regional anomaly.

Treatment of Geophysical Expenditures for Federal Income Tax Purposes

J. W. YARBRO, Southern Production Co., Inc., Fort Worth.

THERE are no clear rules of accounting with respect to treatment of geophysical expenditures. Whether they are to be charged off as spent or capitalized as cost of the property has important tax consequences and presents a dilemma to the tax accountant. Prior to 1942 no one questioned the right to expense all geophysical costs as incurred. Since that date the Internal Revenue Service has maintained that the answer depends upon what is done with the property after the geophysical appraisal is completed. The geophysicist who understands the accounting and tax aspects of geophysical expenditures can greatly help the tax man resolve the problem and achieve the most favorable tax result.

Aeromagnetic Mapping of Regional And Local Basement Structure

NELSON C. STEENLAND, Gravity Meter Exploration Co., Houston.

REGIONAL basement structure may be mapped from aeromagnetic data by the use of the intrabasement type of anomaly and local basement structures may in turn be mapped by the use of the suprabasement type. The characteristics of these anomalies and methods used to resolve them are presented. The application of this system of regional and local mapping is demonstrated from results obtained in the North American Continent and Africa.

Geophysical and Geological Investigation of Sea Mounds in the Gulf of Mexico

W. E. ALLEN, L. STANLEY and T. F. VINING, Superior Oil Co., Houston.

THE results of a geophysical-geological expedition to the edge of the Continental Shelf in the Gulf of Mexico to study sea mounds are reported. The purpose of the expedition was to determine the origin and nature of the large sea mounds found on the edge of the shelf. Data taken include: Gravity measurements, cores, depth-temperature measurements and bottom topography. The mound investigated, while not as large as other known highs, is considered representative of the smaller mounds and is similar, geomorphically, to the larger mounds. The maximum gravity anomaly with associated rim minima developed around the mound suggests a large shallow cap-rock salt dome; therefore from the analysis of the data taken, it is concluded that this mound owes its existence, at least in part, to a salt-dome intrusion and this may well account for the origin of many more sea mounds in the Texas-Louisiana area.

Model Studies of Salt-Dome Tectonics

DR. TRAVIS J. PARKER, A. & M. College of Texas, Department of Geology, College Station.

A LARGE number of models of salt domes were constructed and analyzed in accordance with the theory of scale models. The force causing the upward growth of the model domes was produced by the contrast in the densities of the materials. Single domes were initiated by a variety of methods, and flowage of material into a dome produced a peripheral sink which in turn caused the initiation of a group of "secondary domes" about the outer margin of the sink. The diameters of the model domes were approximately equal to the thickness of the source layer from which they were developed. Layers of overburden above the core were arched and broken by normal faults, and grabens over the centers of many domes occurred as a result of the greater uplift of marginal fault segments. Radial faults were numerous. The fault patterns in the models were controlled by the size and shape of the core, the depth of the core beneath the faulted layer, the amount of uplift of that layer, the configura-

Leland Service

AND

"PARTS DEPOT" beats DOWNTIME WITH Fast Action ANYWHERE

Contractors large and small all over the country rely on Leland for fast, dependable service on their construction equipment and parts needs.

Leland's factory trained service personnel are "on call" at all times to aid in maintaining uninterrupted operations—and Leland's warehouse of *complete parts lines* for leading brands of equipment is acknowledged as one of the biggest and finest in the Nation.

If it's *service or parts* you want — call Leland FIRST!

ON SERVICE & PARTS FOR

CLEVELAND TRENCHERS

•

TULSA WINCHES

•

CHICAGO PNEUMATIC
Compressors & Air Tools

•

THEW-LORAIN
Construction Equipment

•

LELAND BODIES
AND TRAILERS
— and Truck Equipment

•

Leland

EQUIPMENT COMPANY

Oklahoma City • TULSA

tion of the peripheral sink, and the physical properties of the overburden.

Geophysical History of the Chacahoula Dome, Lafourche and Terrebonne Parishes, Louisiana

W. E. HOLLINGSWORTH and **H. C. WESTON,** Sun Oil Co., Beaumont.

THE Chacahoula salt dome of Lafourche and Terrebonne parishes, Louisiana, was first discovered by a Gulf refraction party in 1926. This was followed by later fan shooting and drilling of a test well which found cap rock at 1,300 ft. Gulf then followed with more refraction work and then torsion balance work. Two more dry wells were drilled, and Gulf dropped its leases. Sun Oil Co. took the leases and started exploration in 1934 by fan shooting. In 1938 refraction and reflection profiles were shot to explore for flank production and a discovery well was drilled. Additional reflection work was done periodically to help exploit the find and a final dome outline was completed in 1940. The northeast extension of the salt in the dome was responsible for differing interpretations of the dome outline during the exploration and drilling.

Case History of the Redwater Field

C. J. CHAPMAN, Imperial Oil Co., Ltd., Calgary.

THE exploration history of Redwater oil field is given from the start of exploration in the general area to the development of the fields. Maps are presented to show the development of the geophysical picture. Criteria for outlining the reef area are discussed, and the techniques used are discussed in the light of present-day knowledge.

Geophysical Case History, Cabin Creek Field, Fallon County, Montana

L. F. SCHOMBEL, Shell Oil Co., Billings, Mont.

A DETAILED description is presented of the geological and geophysical interpretations of the Cabin Creek oil field, Fallon County, Montana. The exploration history and subsequent development program are discussed.

The Importance of the Structural Interpretation of Seismic Data

R. A. WEINGARTNER, Stanolind Oil & Gas Co., Tulsa.

AT a time when complicated structural concepts appear to be the rule rather than the exception, too little effort is being spent on the study of stratigraphic and structural possibilities offered by the seismic cross-section data, and too little effort is spent by the geologist in making use of the data. Steps to increase the effort envisage: (1) development of qualified personnel for structural and stratigraphic interpretation with responsibilities limited to the cross-section and map making; (2) construction of seismic cross-sections and display of seismic-map data in the most usable form for all geologists; and (3) a program to encourage the use of seismic file data and the insistence by the geophysicist that the geologist make use of the data on a constant and routine basis. Illustrations are provided to show the inadequacy of our present effort and the need for cross-sections and seismic maps on a scale and in terms understandable by geological personnel of limited experience.

New INTERNATIONAL
6-wheel-drive trucks!

Now, NEW INTERNATIONAL Tandems with 6 *working* wheels! Powerful, load-lugging brutes with plenty of extra traction and pull for the most rugged oil field operations! Plus roomy comfort and easy handling for highway hauling!

Here are new "work horses" that are truly thoroughbreds. They are completely designed and all-truck built by INTERNATIONAL at the factory. There are no compromises or conversions. You get the long-lasting dependability and penny-pinching economy that *earns* you, *saves* you the BIG money.

Get complete details of these all-wheel-drive trucks from your INTERNATIONAL Dealer or Branch today. Models from 22,000 to 33,000 lbs. GVW.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

Only 6 x 6 trucks with all these features:

- **New heavy-duty steering gear and relay assembly for proper ratios . . . easier, safer steering.**
- **Low body and cab height. Ample ground clearance.**
- **Full load-length frame reinforcements that extend beyond front spring front-mounting brackets for additional strength and rigidity.**
- **New "cloverleaf" type transfer case with straight-thru drive for quieter operation and longer driveline life.**
- **New 10-inch sealed parking brake provides extra safety and reduced maintenance.**
- **Famous Comfo-Vision cab with double wall back panel construction and shock absorbing cab mountings to endure the punishment of all off-highway operations. Seats three husky men comfortably.**
- **Cast spoke wheels and tubeless tires standard.**
- **Front-mounted winch, full-torque power take-off and all needed equipment available from the factory.**

INTERNATIONAL TRUCKS

All-Truck Built to save you the BIG money!

Motor Trucks • Crawler Tractors • Construction Equipment
McCormick® Farm Equipment and Farmall® Tractors

POINTING to Wolf Mountain in Cimarron County, Oklahoma Panhandle, William Dixon Neiler, Ohio Oil Co., shows where Ramsey Bros. drilled an important wildcat at 1 School Land, 1927.

WELCOMING 200 conferees, B. W. Beebe, Keating Drilling Co., Oklahoma City, director of the trip, speaks at the first stop on the 700-mile trek through the Oklahoma Panhandle, northeastern New Mexico, and Colorado.

EXPLAINING the route, Harry W. Osborne, consultant from Colorado Springs, tells the group it will traverse rocks ranging in age from Quaternary through Triassic on first day's journey.

WEDDING CAKE BUTTE, a prominent surface feature in Union County, New Mexico, is capped by Morrison-Jurassic rocks.

CARAVAN entering Raton Pass at the New Mexico-Colorado line. Peak in background is Raton Mesa.

THREE LARGEST STRUCTURES in the Raton basin are Vermejo, Tercio, and Morley. All have been drilled. Above is Tercio dome.

Geologists probe pay-zone source to learn why . . .

Northwest Anadarko Basin Scores High on Discovery

by John C. McCaslin
District Editor

THE discovery ratio in the northwestern Anadarko basin is one of the nation's highest. Increased drilling activity in recent months throughout the Oklahoma and Texas Panhandles, southwestern Kansas, and southeastern Colorado has turned the Mid-Continent's exploratory eyes to this highly regarded future oil and gas province. Since the source of many of the sediments and the structural control of the basin lie in south-central and southeastern Colorado, and northeastern New Mexico, the executive committee of the Oklahoma City Geological Society invited more than 200 geologists from Texas, Oklahoma, Kansas, and the Rocky Mountains to join them in a 700-mile trek through this vast geological showcase.

The principal theme of the September conference was to relate the exposed geology of the area to the subsurface of the northwestern Anadarko basin. A secondary theme of the field trip was the examination of the evident Laramide orogeny, Tertiary and recent igneous activity, and the post-Permian stratigraphy of the region traversed.

First leg . . . The first day of the field conference was spent studying rocks ranging in age from Quaternary through Triassic. The area covered was from Guymon, Okla., to Raton, N. M.

Important structural features crossed were the Dalhart basin, Hugoton embayment, and the Keyes dome (these are not obvious on the surface). Well-expressed in surface strata were the Sierra Grande arch and the Raton basin.

The caravan passed through the Keyes gas area of Cimarron County, Oklahoma, located on the Keyes dome. The discovery well at Keyes was drilled by Pure Oil Co. in 1943. Production is from the Keyes sand—Morrow of Pennsylvanian age. Most of the field's development has been in the past 5 years.

Leaving Oklahoma, the geologists entered the dry Cimarron Canyon of northeastern New Mexico, rimmed by mesas that are capped with the lower part of the Dakota-Upper Cretaceous sandstone. The region of the Cimarron Canyon has many sandstone plugs, some of them mineralized. There are four hypotheses explaining these plugs, the best-accepted being the "injection of mobile, water-saturated sand, either from above or below, into the then compacted sediments now encompassing the plugs." (Ben H. Parker.)

Later in the day the caravan crossed the axis of the Baker ranch dome. United Oil Co. (Continental) drilled a test well on this dome in 1919. Top of granite was found at 2,146 ft.

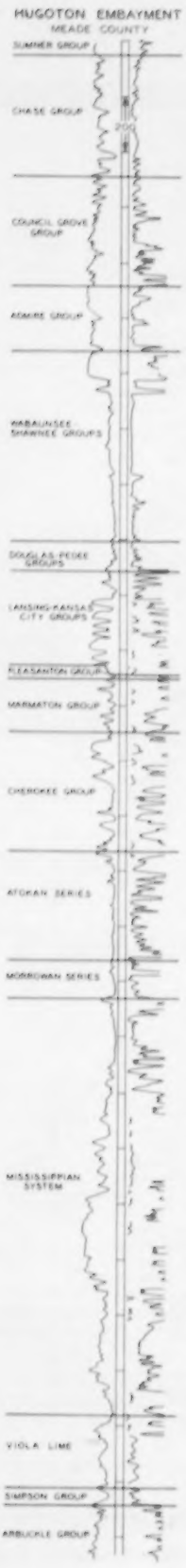
HUGOTON EMBAYMENT
Principal Pay Sands, Fields

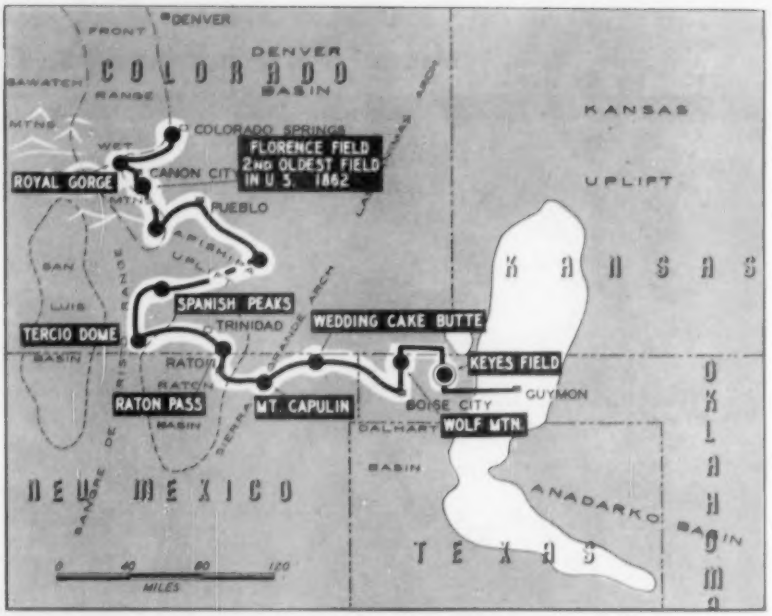
SYSTEM	SERIES	GROUP	FORMATION	TEXAS PANHANDLE	OKLA. PANHANDLE	SW. KANSAS	SE. COLORADO
PERMIAN	Guadalupe						
	Leonard	Sumner	Panhandle lime	Hugoton field			
		Chase	Brown dolomite	Panhandle, Hugoton Quinduno	Hugoton	Hugoton-Greeley	
	Wolfcamp	Council Grove			Northeast Forgan		
		Admire				Dreyer, Greenwood	
	Virgil (Cisco)	Wabaunsee					
		Shawnee	Topeka	Mallett-Cisco Stratford-Cisco	Ridgeway	Dreyer, Greenwood Holt	Greenwood
		Douglas	Tonkawa at base	North Hansford Hitchland, North Hutchinson, Cold-water, Gruver	Laverne, NE		
			Toronto			Holt, Wide Awake	
PENNSYLVANIAN*	Missouri (Canyon)	Lansing Kansas City		Gruver-Canyon		Beyer, Nunn Northfork, Dreyer Greenwood, Westola, Keystone Liberal-Light Ashland	
			Kathryn Basal, Mo.	Cator N. Hansford			
			Checkerboard		Mocane, N.W.		
	Des Moines (Strawn)	Marmaton	Oswego at base		Beaver-Panhandle (ABD), Floris, Greenough-Oswego Light-Oswego Timber Creek	E. Finnup, Nunn Saw Log Creek, Adams Ranch, Novinger, Kismet Kneeland	
		Cherokee		S. Bernstein, N. Hansford, Canadian	West Rice	Nunn, Sonderegger Patterson, Davenport	Bent's Fort
	Atoka		13 finger lime at base	Daniel, McGarraugh, Palo Duro Creek		Bond	Bent's Fort
		Morrow	Keyes at base	Hansford, N. Hansford, W. Prairie, Spearman Twin, Merydith-Keyes Barlow, Butler, Daniel, Farnsworth, Perryton, Novi, Waka	Beaver-Panhandle West, E. Camrick S. E. Boyd, S. W. Camp Creek Dower, N. W. Dower, (Ind.) Purdy, (Sd.), N.W. Elmwood E. Forgan, S. Forgan, S. Glenwood, Grand Valley, N.E. Greenough, S. Greenough, N.W. Knowles, Madison, S.E. Mocane, S.W. Mocane, Keyes Gas Area (Keyes) E. Laverne, S. Laverne, N.E. Laverne, Stockholm Grand Valley Camrick, N.W. Eva, E. Sturgis (Purdy Sd.) Richland Center	Harper Ranch-N. E. Morrison Snake Creek Helfrich, Adams Ranch, Bruno N.E. Bruno, Fringer E. Kismet, Leslie, Novinger, Singley Stevens, Boehm Greenwood, Interstate Richfield Taloga Hawks, N. W. Kismet, Liberal-Light, Shuck, Sparks-Keyes, Wallace	Bent's Fork McClave Harrington
MISSISSIPPIAN			Miss. Lime		Light, Nye	Calvary Creek-Miss., McKinney-Miss., Damme-Miss., Finnup-Miss., Nunn-Miss. lime, Helmers-Miss., Pleasant Valley-Miss., Pleasant Prairie-Miss., Jetmore-Miss., Purdyville-Miss.	
	Chester			Hansford	N.E. Glenwood, Mocane, Harper County	Adams, Ranch, Novinger, Blue Bell, N. W. Blue Bell, S. E. Liberal-Miss.	
	Meramec			Lips (no longer)			
ORDOVICIAN			Viola		Harper County	Ashland	
CAMBRO-ORDOVICIAN			Arbuckle			Grigston Morrison	
			Ellenburger	Laketon-Delp	Woods County		

*Permian and Penn. granite wash produce at Quinduno Panhandle fields Laketon

A SPECIAL FEATURE OF THE OIL AND GAS JOURNAL

THIS FIELD-PAY CORRELATOR gives producing areas in the Hugoton embayment of the western Anadarko basin.





MID-CONTINENT AND ROCKY MOUNTAIN GEOLOGISTS recently took a look at one of the most scenic and geologically important regions in the United States—the northwestern Anadarko basin and south-central Rocky Mountains.

A few miles west, Mount Capulin rises off the floor of the Raton basin's east side. This is the most perfect extinct volcano on the North American Continent, having last erupted about 7,000-10,000 years ago during the last stages of volcanic activity in this region. The cone's youth is well defined by its steep angled slopes, and the unmodified cone and crater.

From Mount Capulin the caravan descended into the Raton basin, a Laramide feature. The basin is asymmetric, with a steep climb on the west side which borders the Sangre de Cristo range, and a gentle east flank west of the axis of the Sierra Grande arch.

West of the Baker ranch dome the group crossed the axis of the Sierra Grande arch. This arch plunges north-northeastward into Las Animas County, Colorado, saddles and continues as the Las Animas arch to the northeast. The arch in its present form is a Laramide feature superimposed on a pre-existing Paleozoic uplift associated with the ancestral Rocky Mountains. The arch was one of the biggest contributors to sediments in the northwestern Anadarko.

Second day . . . The conferees studied rocks ranging in age from Quaternary to pre-Cambrian the second day out. The day's journey began in the Raton basin, crossing over the Raton Pass into Colorado, thence westward through the basin trough to the edge of the Sangre de Cristo range. This trough contains two large structural features, the Morley dome, drilled by Stanolind Oil & Gas Co., and the Tercio dome, drilled by Skelly Oil Co. The cars passed through the famous stone wall of vertical Dakota sandstone beds that form hogbacks along the Sangre de Cristo.

After passing through La Veta Pass, the caravan retraced its steps to Walsenburg across the bifurcated northern end of the Raton basin. Just west of the city the travelers saw the Greenhorn anticline, which plunges south from the Wet Mountains and divides the Raton basin. East of Walsenburg a study of the relationship of the Apishapa uplift to northwestern Anadarko basin was made. This is a permo-Pennsylvanian feature. Back west again toward Pueblo the geologists observed both the San Carlos anticline and the present Sierra Grande arch.

Last day out . . . The third day of the trip was spent in the Canon City embayment, and up the Front Range to Colorado Springs.

The cars headed for the Wet Mountains in the morning, thence down into the Canon City embayment, and then west to the Royal Gorge. The last stop of the day, near Colorado Springs, offered the group an excellent examination of the Morrowan-Glen Eyrie formation.

UNTIL RECENT YEARS, the primary target in the Hugoton embayment was the Chase group, the big Permian gas producer in Hugoton field itself. This region offers one of the most complete sections of potential oil or gas-bearing rocks in the Mid-Continent.

EXPLORATION HIGHLIGHTS

WESTERN CANADA

SASKATCHEWAN

Oil Show Found At Creelman Wildcat

A British-American Oil Co., Ltd., operated team including Phillips Petroleum Co. of Oklahoma, and Husky Oil & Refining, Ltd., has recorded an interesting oil show in the Mission Canyon member of the Mississippian formation at a wildcat venture in the Creelman area of southeast Saskatchewan. The indicated discovery was recorded 4 miles south of Creelman railpoint and 15 miles north of North Midale field oil wells and 25 miles east-northeast of Weyburn town.

This well, B.A.-Husky-Phillips 12 Griep, on LSD 12, 28-9-10w2, lies 3½ miles southeast of the Sohio 13-6 Creelman wildcat abandonment. During a drill-stem test in the discovery horizon, around the 3,900-ft. level and covering a 34-ft. interval, 60 ft. of gassified oil flecked mud and 70 ft. of gassy mud-cut oil was recovered from the drill-stem. The team is carrying out further test operations in the Mission Canyon at the present time. Current total depth of the well is 4,008 ft.

● Canadian Oil Companies, Ltd. is preparing to complete its White Rose 14-31 Weyburn, Weyburn field well in the Mission Canyon zone of the Mississippian. This southeast Saskatchewan test was drilled on LSD 14, 31-6-13w2, 1 mile southeast and the same distance northwest of previous field completions, has the distinction of being the first well in the immediate producing area to flow oil on drill-stem test from the Mission Canyon zone and is also the second well in the vicinity to indicate commercial production from the zone. The other test at Weyburn to indicate production from the Mission Canyon was drilled by McAlester Canadian Oil Co., 3 miles south-southeast. That well did not flow during test operations but a pipe recovery of 4,000 ft. of clean oil was made. The producing zone in the Weyburn field has been the Charles horizon.

ALBERTA

Production Test Run At Crossfield Discovery

The Cardium sand formation at Shell Oil Co.'s A-13-2 Crossfield exploratory well, that is situated 18 miles north of Calgary, flowed oil at the rate of 170 bbl. per day during production test run through a 14/64-in. choke. The test was run in the second Cardium sand zone through a 12-ft. perforated interval around the 6,720-ft. level. Prior to that production test the zone was treated with acid and a fracture job carried out.

This dual zone discovery well, was drilled by Shell Oil on LSD 13, 2-28-2w5, ¾ mile southwest of the Imperial-Anglo 1 Crossfield capped Mississippian gas well. The Cardium sand that is now undergoing extensive evaluation tests yielded free oil on drill-stem test while the other discovery zone, the Shunda member of the Mississippian, gave up wet gas during drill-stem test operations.

There was no evidence of formation water during flow test and gravity of the oil has been estimated at 36°. The operator is currently carrying out further evaluation tests on the Cardium zone to better find the commercial worth of this interesting strike.

PACIFIC COAST

CALIFORNIA

Union Scores Important San Joaquin Discovery

Union Oil Co. of California has scored what is already being hailed as the most significant discovery in southern San Joaquin Valley in several years with a wildcat 1 mile west of Arvin area production in Mountain View field. Union, acting as operator for itself and Hancock Oil Co. brought in 55-X-21 Stenderup flowing 1,213 bbl. daily of 27.5°-gravity crude from the Derby sands at 9,525-9,717 ft. This interval is between the Santa Margarita and Vedder sands in Upper Miocene. Total depth of the well is 12,514 ft.

Union has staked a location for the first offset to this discovery in SW NE 21-31s-29e. Union has a 75 per cent interest and Hancock a 25 per cent interest in a 4,450 acre block surrounding the discovery.

Signal Completes Fourth Redondo Beach Well

Signal Oil & Gas Co. has completed the fourth slant-drilled well under the Pacific Ocean from an offshore site at its Redondo Beach tidelands lease. Under terms of the agreement between Signal, Artnell Oil & Gas Co. and Reserve Oil & Gas Co. and the city of Redondo Beach, the three companies can complete six wells from the single sound-proofed onshore site and then must move out beyond the breakwater for any further development drilling. This newest completion was plugged back from total depth of 7,616 ft. to the producing interval at 4,545-5,079 ft. Initial production was 92 bbl. daily of 14.5°-gravity crude cutting 8 per cent.

Texaco Recompletes Old Well for Gas Discovery

The Texas Co. recently went back into a well which was originally completed as a gas discovery in 1943 and recompleted it for a deeper gas pool find. The well, 38-16 Gill, located in the Gill ranch region of Madera County, was reperforated in the interval 5,743-60 ft. and completed flowing gas at a 3,106 M.c.f. daily rate through a ⅞-in. choke. Production is coming from the Panoche zone.

APPALACHIAN

EASTERN KENTUCKY

Kentucky West Virginia Gas Co. has completed 1058 James F. Harris as a small gasser. Located on Brandykeg Creek in the Floyd County sector of Big Sandy gas field the test, after shot, gaged initially at the rate of 127,000 cu. ft. of gas daily. Producing horizon is Devonian black shale from 1,952-2,523 ft. total depth.

Kentucky West Virginia has completed a good well at its 6336 George Allen located on Long Branch in Magoffin County. Producing horizon is the Silurian Big Six sand topped at 2,715 ft. and bottomed at 2,771 ft. Gas started to show at 2,749 ft. at the rate of 622,000 cu. ft. daily and increased to 1,979,000 ft. at total depth. Well was completed naturally.

WEST VIRGINIA

In Sherman district, Hampshire County, West Virginia, M. E. Anderson, I. J. E. and B. Orndorff, wildcat

Exploration this week

Western Canada	177
Pacific Coast	177
Appalachian	177
West Texas-New Mexico	180
Hugoton Embayment	182
Rocky Mountains	183
Great Lakes	183
South Texas	183
South Louisiana	184
Successful Wildcats	185

for fast, sound welds...right

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

down the line

SPECIFY REPUBLIC ELECTRIC RESISTANCE WELD LINE PIPE

STRONG, SAFE CONNECTIONS are assured by Republic Alloy Steel Studs. Tough full threads provide powerful clamping action without stripping or slipping, yet back off easily for maintenance of equipment. Alloy composition resists corrosion, defies high temperatures or pressures. Order Alloy Steel Studs from your Republic Distributor. Or mail coupon for information.

Quick, accurate field-joint line-up plus fast welding, free of costly delays—these important advantages help you get more miles of sound welds per day, with Republic Electric Resistance Weld Line Pipe. Reason: *uniformity* throughout every joint you receive.

Republic Electric Resistance Weld Line Pipe is formed from flat-rolled steel, uniformly thick from edge to edge and end to end. As a result, pipe is uniformly concentric, uniform in wall thickness—easy to line up, easy to weld. You get smooth, uniform bends because the steel is highly ductile. And its uniform, high-yield strength permits building high-pressure lines. All of these factors combine to facilitate fast, sound welding . . . to help you maintain laying schedules.

Visual inspection of the flat steel before forming results in scale-free surfaces that prevent clogged valves and regulators . . . helps assure years of dependable, trouble-free service in the completed line.

Whatever your oil or gas line-pipe requirements for transmission, gathering, or distribution, look to Republic for top quality line pipe products. Types available include Electric Resistance Weld in sizes 2⅜″ through 16″ O.D., Electric Fusion Weld from 24″ through 30″ O.D., and Continuous Butt Weld from ¼″ through 4″ nominal.

For complete information, contact your local Republic office—or mail the coupon, today.

INSTANT, ACCURATE COMMUNICATION throughout your entire pipeline operating area is easy when you install a micro-wave radio system. Vital link is your broadcasting tower, like the 175-foot self-supporting Truscon Micro-Wave Tower shown here. Truscon Towers are world famous for reliability under all weather conditions. Available in all types. Send coupon for details.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-2206
3112 East 45th Street, Cleveland 27, Ohio

Please send me further information on:

☐ Line Pipe ☐ Alloy Steel Studs ☐ Truscon Towers

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

deep test completed as a gas well in the Oriskany sand 4,813-4,976 ft., gas 4,872-75 ft. This well was fractured twice and resulted in a flow of 250,000 cu. ft., with a rock pressure of 2,050 psi. in 48 hours. The total depth was 8,030 ft., but the hole was plugged back to 4,970 ft.

PENNSYLVANIA

● Gaskill Township, Jefferson County, Southwest Pennsylvania, Columbian Carbon Co., 1835 Frank M. Sheesley, was fractured and had gas testing 3,861,000 cu. ft., but no further drilling has been done below its present depth of 7,551 ft.

● In Brush Valley Township, Indiana County, this company's 1836 I. R. Smith, had a show of gas in the chert which was fractured and is still testing. The first gage was 793,000 cu. ft.

OHIO

Another good well was completed in the new Gratiot pool, in western Hopewell Township, Muskingum County, by Lamp and Zaccagini on 1 American Legion, Lot 33. The Clinton was logged at 3,105-47 ft. and gaged 300 bbl. in 24 hours after fracture.

● Two wells were finished in Walhonding pool in New Castle Township, Coshocton County. R. B. Weed et al, 1 C. and B. Williams made 200 bbl. in 24-hours after fracture from Clinton at 2,993-3,047 ft. and the Preston Oil 4 R. F. Rodehaver made 82 bbl. after fracture from sand at 2,952-91 ft.

● The first offset to the discovery on Stewart in Clark Township, Coshocton County, gaged 900,000 cu. ft. after fracturing Clinton sand found at 3,585-3,614 ft. The completion was by Ohio Fuel on G. L. Oakes, Section 19.

GONE FISHING! .....spells TROUBLE in Drilling Operations

Yes—thread failure on drill collars and tool joints *can* mean troublesome, costly fishing jobs—and sometimes complete loss of expensive drilling strings.

A break-out of galled and frozen joints costs money through shut down—damaged threads mean replacement of drill collars and pipe.

So—it pays to use the best.

Lubrication Engineers, Inc. are specialists in the field of quality lubrication and have developed two outstanding products that are saving dollars every day in the drilling industry.

LE #195 Drill Collar Compound is a scientific combination of metallic materials—built to withstand the high torque—pressure—and temperature of deep drilling. Forms tight leakproof seals—yet permits easy disassembly of mechanical joints.

LE #900 Tool Joint Compound is a non-hardening —easy to apply—metallic base product. Resists moisture—gives maximum assurance against galling and freezing—lengthens thread life.

AVAILABLE THROUGH MOST LOCAL SUPPLY STORES, OR WRITE, WIRE OR CALL FORT WORTH OFFICE DIRECT

LUBRICATION ENGINEERS, INC.
FORT WORTH, TEXAS
INDUSTRIAL LUBRICANTS AND OIL FIELD SPECIALTIES

WEST TEXAS-NEW MEXICO

WEST TEXAS

Irion County Gets Another Wolfcamp Strike

Northern Irion County had prospects of another Wolfcamp discovery at Southwestern Development Co., Wickett Refining Co., and Tucker Drilling Co. 1 A. S. Sugg, 10 miles northwest of Mertzon. Location in Section 1893-B, Verbene Survey, is about 4 miles southeast of Plymouth Oil Co.'s 480-bbl. Wolfcamp opener, reported last week.

Wickett Refining Co. et al 1 Sugg recovered 1,700 ft. of clean oil on drill-stem test in the Wolfcamp at 5,532-51 ft. Operators then perforated at 5,535-55 ft. and the well flowed 9 bbl. of oil an hour for 4 hours after washing with mud-acid. At last report it was shut in for storage.

Stanolind Oil & Gas Co. 1-A A. A. Sugg, 14-2-H&TC, 4 miles southeast of the above discovery, has been completed as a Canyon sand discovery. Initial potential, on the pump, was 39.59 bbl. of 37° oil, plus 33 bbl. of salt water, from perforations at 6,404-10 and 6,414-24 ft.

Stanolind 1 Burke, wildcat in Section 1032, EL&RR Survey, 6 miles northwest of Mertzon, has set pipe at 7,817 ft. for completion attempt. A drill-stem test in Canyon sand at 6,468-87 ft. developed a small amount of free

Latest in a series of Wolfcamp strikes for Irion County is Southwestern Development Co., Wickett Refining, and Tucker Drilling 1 Sugg, northwest of Mertzon.

You can't live on love . . .

. . . and most publications find it tough to live on subscriptions alone. This is especially true of industry magazines such as ours, which is designed to serve an important but relatively small part of the nation's reading public.

Paid subscriptions help, of course. But without advertising revenue it would be next to impossible to give adequate coverage to industry matters. In short, our editorial policy would be impaired. That's why sound business relations between advertisers and publishers are vital.

The Audit Bureau of Circulations is the keystone of relations between advertiser and publisher. It is a nonprofit, cooperative service association having 3,700 publisher, advertiser, and advertising agency members. ABC defines, audits and reports net paid circulations of The Oil and Gas Journal and other publisher members.

The ABC's sole purpose is to give the advertiser an accurate picture of The Journal's net paid circulation. . . . While this information is primarily to protect the advertiser, it is of genuine importance to the reader because the report serves as a guide to Journal editors.

AUDITED PAID CIRCULATION ABC

By studying circulation progress shown in ABC reports we know whether or not we are serving the reader. When circulation increases we know we're on the beam. If it dips, we try to find out why and then to apply corrective measures.

All this information guides our editorial planning—to bring to you just what you want to read. To get new subscribers, readers, and advertisers, we must give you a publication you find both interesting and useful. Unless we do, you'll not want The Journal—and neither will the advertiser.

the OIL AND GAS JOURNAL

oil, 470 ft. of oil and gas-cut mud and 250 ft. of drilling mud. This well went into the Ellenburger at 7,615 ft., by samples.

Pecos County Gasser Completed

Southland Royalty 1 Lilly Anna, wildcat 1 mile north of Imperial, has been completed as a gas well from the basal Permian. Perforations were at 4,816-88 ft., and calculated open-flow potential was 22,000 M.c.f. per day. Location is in Section 18, Block 3, H&GN Survey.

G. S. Hammonds 1 J. W. Robbins, in the north extension area of Puckett field, has run 5½-in. pipe to test the Ellenburger. Drill-stem tests were not run in that formation, but the top at 12,625, minus 9,416 ft., was said to be high enough to assure gas pay.

This well indicated gas production from the Devonian and flowed 52° oil from a Simpson section.

NEW MEXICO

Lawton Field's Sixth Well Makes High Potential

Lawton-Devonian field in northeastern Lea County, shown on some maps as North Gladiola, gained its sixth producer and a ⅜-mile southeast extension.

The latest producer and extension is Ralph Lowe 1 Aztex-Adamson, 5-12s-38e. From 32 ft. of perforations, starting at 12,000 ft., the well flowed at the rate of 3,168 bbl. a day. This was based on a 6-hour flow test through ¾-in. choke. Oil was 47.2° and gas-oil ratio was 150:1.

Humble Oil & Refining Co. 2 South Four Lakes Unit, 2-12s-34e, new pay opener in the South Four Lakes (Pennsylvanian) field, flowed 140 bbl. of oil in 7 hours through 20/64-in. choke, then gaged 210 bbl. in 9 hours through ¼-in. choke. The rig was down at last report, and potential tests were under way.

Texaco 1 Muse-Federal drilled ahead below 11,123 ft. after getting shows in Bone Springs. Location is just north of abandoned Salt Lake field.

Bone Springs Shows

The Texas Co. 1 Muse-Federal, 7-20s-33e, a deep wildcat in the shallow North Lynch field, indicated production from the Bone Springs. A 3-hour drill-stem test at 10,455-10,502 ft. had gas in 55 minutes and recovered 91 ft. of distillate-cut mud, plus 1,578 ft. of distillate. Operators drilled ahead on a 15,000-ft. contract.

New pay in new field . . . Sinclair Oil & Gas Co. 2 Seaman Unit, 19-16s-34e, southeast offset to its recent Pennsylvanian discovery, recovered oil from the Wolfcamp. This formation had no shows in the discovery.

No. 2 Seaman recovered 1,200 ft. of water blanket, 30 ft. of oil and 300 ft. oil and gas-cut mud on a 2-hour test at 10,130-10,204 ft. Top of the Wolfcamp was 10,134 ft.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Beaver Has Prolific Dual Gas Discovery

A prolific gas discovery with production from both the Hoover and Mississippian is indicated for Beaver County. The discovery prospect is Cabot Carbon and Eason Oil Co.'s 1 Ryser, C NE SW 9-3n-28eCM, 12 miles northeast of Laverne.

The well flowed 2,810 M.c.f. of gas per day from perforations in the Mississippian at 7,318-33 ft. After fracture the well made 30,000-40,000 M.c.f. per day from the Hoover at 4,450-83 ft.

SOUTHWEST KANSAS

New Oil Pool in Hodgeman County

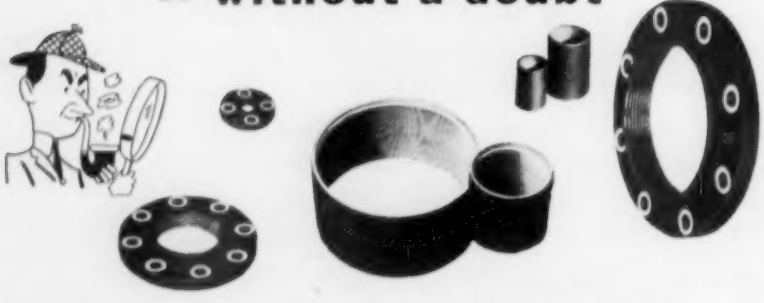
The first discovery in Hodgeman County in some time was completed last week by Kewanee Oil Co. The 1 Larkin, SW NE SW 15-22s-25w, 7 miles west of Jetmore field, pumped 250 bbl. of oil per day from three sets of perforations at 4,628-38, 4,614-22, and 4,600-10 ft.

Triple Completion Reported in Morton County

A wildcat in Taloga pool, Morton County, extreme southwest Kansas, was completed from three zones. Carter

Harrisburg Flanges and Couplings

-- without a doubt



There is no doubt in the minds of users as to the performance of Harrisburg Flanges and Couplings in the Petroleum Industry. The many millions in use indicate the universal confidence of our customers.

Harrisburg Drop-Forged Pipe Flanges are made to A.S.A. Specifications, in threaded, butt-welding, slip-on welding, Van Stone and blind types. Closely controlled analysis, accurate machining and rigid inspection standards insure uniformly high quality flanges for oil field, utility and industrial uses.

Harrisburg Seamless Steel Pipe Couplings are made to A.P.I. and A.I.S.I. Specifications. They are threaded by a special process developed in Harrisburg's own Engineering Department. Threads are accurate in form, height, angle and lead and are electro-galvanized to prevent seizing and galling.

More than a century in Harrisburg

Harrisburg Steel Co.

Division of Harsco Corporation

Send for literature and prices.

Harrisburg 6, Pennsylvania

Oil Co.'s 1 Cyr Trust in C NE 2-35-42 flowed 5,690 M.c.f. of gas per day from the upper Morrow sand at 4,232-46 ft.; it flowed 235 bbl. of oil per day from the lower Morrow sand at 4,562-72 ft.; and 3,310 M.c.f. per day from Topeka at 3,032-68 ft.

Gas Discovery Finaled In Meade County Area

A new gas pool was opened in Meade County at Monsanto Chemical Co. 1 Horace, C SE SE 9-34-29, 2½ miles east of Bromwell pool. The discovery flowed 1,500 M.c.f. of gas per day from perforations at 5,815-26 ft. Production is from the Morrow sand.

TEXAS PANHANDLE

Oil Strike Completed In Gray County

Dearborn Oil Co. 1 Heaston, 6 miles northwest of Lawton in Gray County was completed after a long period of testing pumping 50 bbl. of oil and 70 bbl. of water in 24 hours. Perforations were at 10,080-10,100 ft.

This discovery well also flowed 3,500 M.c.f. of gas per day from perforations at 10,639-48 ft. Location is in Section 120, Block M-2, BS&F Survey.

ROCKY MOUNTAIN

WYOMING

New Pay at East Salt Creek Looks Big

A Tensleep new-pay discovery in Natrona County's East Salt Creek field swabbed and flowed at the rate of 81 bbl. per hour for 12 hours from perforations at 7,542-70 ft. The discovery is Sinclair Oil & Gas Co.'s 8 Government, SE NW SW 10-40n-78w. Calculated potential of this well is 1,944 bbl. of oil per day.

Sinclair's prolific discovery well has more than 100 ft. of effective pay in the Tensleep. This is the first well in the field to test to the Tensleep.

GREAT LAKES

MICHIGAN

A 2,000-gal. acid treatment to Salina dolomite pay boosted gas flow from 280,000 cu. ft. a day, natural gage, to 1,350,000 cu. ft. a day at The Taggart Co., McClure Oil Co. and D. B. K. VanRaalte 1 Koopman, NE NE SW 16-4n-14w, Overisel Township discovery well, Allegan County.

Before the discovery was completed and shut-in, Taggart completed north 160-acre offset good for 1,250,000 cu. ft. of gas a day, gaged, after a 2,000 gal. acid treatment. This offset showed for 520,000 cu. ft. of gas daily from Salina pay drilled between 2,652-75 ft. prior to acid treatment.

Currently, this same operator is drilling below 2,000 ft. at the 1 Hoffman-Kleffen, C SE 16-4n-14w.

New Hillsdale County Trenton gas discovery well, which was gaged good for 1,300,000 cu. ft. of gas a day natural this week, was about ready for completion as a new discovery producer for southern Michigan. Wildcat probably will not be produced until additional drilling in the area establishes a field in the area permitting construction of a gas gathering and transmission system.

This wildcat is Clifford A. Perry 1 House-Knecht, NW SE NE 10-5s-3w, Scipio Township. Trenton was logged at either 3,563 or 3,575 ft.

SOUTH TEXAS

TEXAS GULF COAST

Two Het Zones Produce In Bee County Discovery

Another gas-productive area is being opened in southwestern Bee County.

The noted series from the Oil and Gas Journal now available in one volume

FUNDAMENTALS OF

RESERVOIR ENGINEERING

By JOHN C. CALHOUN, Jr.

A clear and concise discussion of the principles of petroleum reservoir engineering as applied to improve techniques in oil and gas recovery. Deals with:

- Behavior of Reservoir Fluids
- Study and Treatment of Rock Properties
- Fluid Flow in Porous Media
- Reservoir Energies and Forces
- Estimation of Oil in Place and Oil Production

With many illustrations, diagrams and graphs.

Order Today—Use This Coupon

THE OIL AND GAS JOURNAL, Tulsa 1, Oklahoma

Please send.....copies of FUNDAMENTALS OF RESERVOIR ENGINEERING, @ $6.00.

Name.....

Address.....

City.....State.....

☐ Payment enclosed ☐ Purchase Order Enclosed ☐ Send Bill

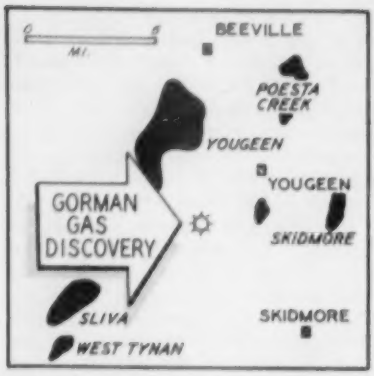
USE KINZBACH WHIPSTOCKS TO SIDETRACK YOUR HEADACHES

Kinzbach Whipstocks can be set at any depth and require no support for the bottom. Positive setting slips prevent slipping or turning in the hole. The Kinzbach hinge arrangement assures that the top of the Whipstock will be close against pipe wall at all times, permitting easy passage of drilling tools. Setting trigger always locates the Whipstock between couplings so that the window will be within one joint. Kinzbach Whipstocks are available in all popular casing sizes through your supply store.

KINZBACH TOOL CO INC

Export Office: 74 Trinity Pl. New York, N.Y.

KINZBACH TOOL CO., INC. • P. O. BOX 277 • HOUSTON, TEXAS



PORTION of southwestern Bee County showing location of Gorman's gas-discovery well.

Discovery well, drilled by J. W. Gorman, is 6½ miles southwest of Beeville in the Martin Lawler Survey. It is productive from the Heterostegina horizon with two pays, one perforated at 2,657-63 ft., and the other at 2,358-65 ft.

The lower zone is estimated good for 60,000,000 cu. ft. of gas per day, and has shut-in pressure of 1,107 psi. The upper zone is productive at the rate of 10,500,000 cu. ft. per day. Pressure is 985 psi. Hole was drilled to 3,900 ft. Gas is dry.

The well is the operator's second test on its Link Estate lease. The first test, 2,430 ft. northeast, was dry. The area is 2½ miles southeast of Yougeen field.

Production Indicated in Jackson County Wildcat

Testing is under way at an indicated gas-condensate discovery well in southern Jackson County, near the Calhoun county line.

The prospective discovery is by Superior Oil Co. at its 1 Weed. The well was drilled to 11,956 ft., and is cased to 9,992 ft. A test with pipe perforated at 8,786-94 ft. got a gas flow estimated at 1,210,000 cu. ft. per day. Gas carried a spray of 57°-gravity condensate. Pressure initially was 1,200 psi., but declined to 950 psi.

Location is southwest of Midway, in Jackson County, and 1⅓ miles northeast of the Point Comfort area, on the Jackson-Calhoun county line. It is 6 miles north of Olivia, in Calhoun County.

SOUTHWEST TEXAS

Pharr Wildcat Uncovers Another Frio Reservoir

Bettis & Shepherd have uncovered another Frio gas-reservoir in the Pharr area. It is in their 1 Crutchfield, 3 miles south of town, and southwest of production in Pharr field. The discovery is designated as "Shepherd" field.

Testing perforations at 7,019-26 ft., the well flowed at rates ranging from 3,086,000 cu. ft. per day through ¼-in. choke with pressure of 2,050 psi. to 1,439,000 cu. ft. per day through 5/32-in. choke with pressure of 2,509 psi. The well is rated good for 7,000,000 cu. ft. per day open.

Gas carried a 59°-gravity condensate in the ratio of 73,940 cu. ft. per barrel.

SOUTH LOUISIANA

Deep Oil Pay Opened in Golden Meadow Wildcat

Natural Gas & Oil Co.'s discovery well 2 miles northeast of the sprawling Golden Meadow field, in the tidal marsh area of coastal Lafourche Parish, produced at the rate of 146 bbl. of 39.3-gravity oil per day during its potential gage, taken through 7/64-in. choke. Flow was under pressure of 1,450 psi. with gas-oil ratio of 113 cu. ft. per barrel. It carried only a trace of water.

STEEL
every kind
in stock
for the Oil and Gas Industry
CARBON STEEL—BARS • STRUCTURALS • PLATES • SHEETS • TUBING, ETC.
STAINLESS—PIPE • TUBING • SHEETS • PLATES • BARS, ETC.
ALLOY STEEL—PRE-TESTED ALLOYS IDENTIFIED BY HEAT NUMBER
ALSO—SAFETY PLATE • GRATING • EXPANDED METAL • CHAIN • WIRE ROPE
REINFORCING BARS • PLASTIC PIPE & TUBING • MACHINERY & TOOLS
RYERSON
JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN.
PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO
CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

The well is Natural's 1 Louisiana Land & Exploration Co. It was drilled to 12,323 ft., and produces from perforated interval at 11,161½-64½ ft. Spot location is in 39-19s-22e.

LOUISIANA OFFSHORE

Deeper Gas Pay Tested In Eugene Island Field

Another sand has been proved productive in Pure Oil Co.'s multiple-pay Eugene Island Block 32 gas field in the Gulf of Mexico, 7 miles offshore from St. Mary Parish. The sand, perforated at 12,475-12,526 ft. and 12,535-51 ft., is the deepest so far in the area.

The well, 1-F OCS 0196, in Block 32, was drilled to 16,868 ft. as the deepest test in the field so far. Hole was plugged back to 12,552 ft. for the completion.

Tested through 11/32-in. choke, the well flowed at the rate of 12,620,000 cu. ft. of gas per day with pressure of 6,580 psi. Shut-in pressure is 8,070 psi., the highest recorded in the field. Fluid (50°-gravity condensate) was estimated at 12 bbl. per 1,000,000 cu. ft. Open flow is calculated at 38,000,000 cu. ft. of gas per day.

This is Pure Oil Co.'s twelfth productive well in the field, discovered in 1949. Location is near the center of the present productive area. Its drilling platform is in 15 ft. of water. Sands already proved productive range in depth from 8,500 ft. to that of the newly completed well.

Successful Wildcats

NORTH LOUISIANA

Concordia Parish: Estate of William G. Helis 1 F M. Thomas et al., C NW NE 32-7n-7e, 1 mile N of Ross Bayou field. IPF 85 BOPD, ⅛-in. choke, perf. at 5,017-20 ft. Wilcox-Burril sand. TD 6,200 ft. Gravity 44.8°. (Opens Normandy field.)

La Salle Parish: Hunt Oil Co. H-118 La. Delta Hardwood Lumber Co., C NE NE 13-5n-3e. 3⅛ miles NE of North Big Island field. IPF 60 BOPD, 12/64-in. choke. Wilcox sand 4,635-40 ft., 38.5°. TD 5,800 ft. (Opens Sandy Bayou field.)

SOUTH LOUISIANA

Jefferson Davis Parish: Trice Production Co. 1 Trimble, 16-9s-5w. IP 55 BCPD and 3,300 M.c.f. daily, ¼-in., 56.8°, perfs. 9,118-24 ft. TD 11,010 ft. (New pay in Welsh field.)

Lafourche Parish: California Co. 2 Calco-Superior-Jones, 60-17s-21e. IP 144 BOPD, ⅛-in., 30.4°, perfs. 10,604-16 ft. TD 13,602 ft. (New pay in Cut Off field.)

Stanolind Oil & Gas Co. 1 Clemille Lerille Unit, 19-18s-21e. IP 8 BCPD and 1,500 M.c.f. daily, 7/32-in., 47°, perfs. 11,138-52 ft. TD 12,030 ft. (New pay in Bully Camp field.)

Plaquemines Parish: Continental Oil Co. 1 Delacroix, 16-15s-14e. IP 252 BCPD and 3,834 M.c.f. daily, 7/32-in., 44.3°, perfs. 11,381-88 ft. and 11,417-79 ft. TD 12,100 ft. (New field.)

TEXAS GULF COAST

DeWitt County: Midstates Oil Corp. and Blanton Drilling Co. 1 Semmler, J. S. Turner Sur., A-460. IP 8,000 M.c.f. daily, open-flow potential, GOR 27,647 cu. ft. per barrel, 50.2°, perfs. 8,125-58 ft. TD 8,303 ft. (Extends Meyersville field.)

Goliad County: Continental Oil Co. 2 Straube, R. Carlisle Sur., A-93. IP 10 BOPD, ⅜-in., 32.6°, perfs. 7,592-7,601 ft. TD 11,666 ft. (New field.)

Jackson County: H. J. Chavanne, Trustee, et al 1 W. L. Moody, Jr., N. McFarland Sur., A-42. IP 21,600 M.c.f. daily, open-flow potential, GOR 12.3 cu. ft. per barrel, 61°, perfs. 7,291½-97½ ft. TD 8,676 ft. (New field.)

Wharton County: Ada Oil Co. 1 Duncan, S. F. Austin Sur., A-5. IP 35,000 M.c.f. daily, open-flow potential, dry gas, perfs. 4,926-36 ft. TD 5,076 ft. (New field.)

SOUTH LOUISIANA

Cameron Parish: California Co. 1-A OCS 0541, Block 160, East Cameron area, Gulf of Mexico. IP 43 BCPD and 2,022 M.c.f. daily, ⅝-in., 52°, perfs. 8,664-8,700 ft. TD 11,193 ft. (New offshore field.)

Iberia Parish: Shell Oil Co. 3 State Lease 2489, Township 12s-8e. IP 98 BCPD and 3,146 M.c.f. daily, ⅝-in., 40.8°,

how can diamonds save you money?

Custom-fitted D & S diamond core and drill bits make hole faster, save time and money.

examples:

South Louisiana Rig: $60 a foot saved . . . considering overall costs. Miocene Formation.

Oklahoma Rig: $12 a foot saved in Bromide Formation.

WRITE OR CALL TODAY! One of our sales engineers will call on you and explain our custom-services and equipment. Herein lie the real D & S advantages.

Drilling & Service

DIAMOND DRILLING EQUIPMENT
6210 NORTH CENTRAL EXPRESSWAY | DALLAS, TEXAS
OFFICES IN ALL PRINCIPAL OIL AREAS

"Personally, I thought we wuz' doin' all right on dry land!"

perfs. 13,093-13,110 ft. TD 13,344 ft. (New pay in Loisel field.)

Iberville Parish: Glassnell & Glassnell 6 Cotton et al., 47-9s-9e. IP 144 BOPD, ⅛-in., 25°, perfs. 8,094-8,101 ft. TD 8,499 ft. (New pay on northeast flank of Bayou Boullion dome.)

Jefferson Parish: Humble Oil & Refining Co. 1 L.L. & E., Township 18s-24e. IP 194 BOPD, ⅛-in., 30.9°, perfs. 10,376-94 ft. TD 11,000 ft. (Second well, new pay, and first oil production in Three Bayou field.)

SOUTHWEST TEXAS

Bexar County: R. V. Easley and George A. Rudes 1 Bennett, F. A. Ruiz Sur. 47, A-614. IP 38 BOPD (net), 22°, open-hole 1,206-1,325 ft. TD 1,325 ft. (New field.)

Brooks County: Humble Oil & Refining Co. 5 Scott & Hooper, ACH&B Sur. 107. IP 107.64 BOPD, ⅛-in., 46°, perfs. 6,234-44 ft. TD 6,941 ft. (New pay in Scott & Hooper field.)

MICHIGAN

Allegan County: The Taggart Co., McClure Oil Co. and D. B. K. VanRaalte 1 Koopman, NE NE SW 16-4n-14w. 1,350,000 cu. ft. gas from Salina dolomite gas pay 2,560-58; 2,665-67 ft. TD 2,680 ft., PBTD 2,668 ft. (New deeper pay in Overisel pool. New gas pool.)

Clare County: R. H. Wolcott 1 Walter, NW SW SW 24-17n-4w. Michigan Stray sand 1,346 ft. 1 BOD, pay 1,344-57 ft. TD 1,379 ft. (New pool.)

WEST VIRGINIA

Hampshire County, Sherman district: M. E. Anderson, 1 J. E. and B. Orndoff elevation 1,281 ft., 250,000 cu. ft., gas, after second fracture, rock pressure 2,050 psi. in 48 hours, Oriskany sand 4,813-4,976 ft., gas 4,872-75 ft. TD 8,030 ft., (plugged back to 4,970 ft.)

ALBERTA

Colorado 6-21 Saddle Hills, LSD 6, 21-76-8w6. Cadotte gas well. TD 8,227 ft.

Cree-Scurry-Rainbow-Texaco 13-12 Breton, LSD 13, 12-48-4w5. Cardium oil well. TD 5,982 ft.

SASKATCHEWAN

Imperial 3-14 Oxbow, LSD 3, 14-3-2w2. Mississippian oil well. TD 4,375 ft.

Imperial 15-9 Manard, LSD 15, 9-6-7w2. Mississippian oil well. TD 4,750 ft.

Husky-Mic Mac-Canadian Superior 1 Douglaston, LSD 9, 5-4-2w2. Charles oil well. TD 4,496 ft.

UTAH

San Juan County: Shell Oil Co. 1 Recapture Creek, C SE SW 21-40s-23e. IPF 34 BO in 2 hours, 42° gravity. Upper Hermosa discovery, new field. TD 5,526 ft.

WYOMING

Lincoln County: General Petroleum Corp. 1 Trojan-USL NW NW NE 5-26n-113w. IP 600 M.c.f. of gas per day, second Frontier sand discovery, new field. TD 7,602 ft

CALIFORNIA

Kern County: Union Oil Co. of California 55-X-21 Stenderup et al, NW SE 21-31s-29e, 1,213 BOPD, 27.4° gravity, 12 per cent cut, 44/64-in. choke, perfs. 9,525-9,717 ft. TD 12,514 ft. (New Upper Miocene pool discovery 1 mile west of Arvin area of Mountain View field.)

SOUTH TEXAS

Aransas County: Western Natural Gas Co. 28 Charles Ranch, Aransas County School Lands, A-7. IP 3,308 M.c.f. daily, shut-in pressure 2,250 psi., perforations 8,476-84 ft. and 8,506-12 ft. TD 8,764 ft. (New field—Headquarters.)

Brooks County: Associated Oil & Gas Co. 3-C Cage, Guadalupe Del Encinal Grant —Leonard Vargas Sur., A-603. IP 19,500 M.c.f. daily, open-flow potential, GOR 30.4 M.c.f. per bbl., 64.5°, perforations 7,625-35 ft. TD 8,149 ft. (New pay in Cage Ranch area.)

Brazoria County: Phillips Petroleum Co. 2-M Houston, Perry & Austin Sur., A-110. IP 4,451 M.c.f. daily, open-flow potential, GOR 58.3 M.c.f. per bbl., 54°, perforations 11,396-11,404 ft. TD 18,006 ft. (New pay in Chocolate Bayou field.)

Jefferson County: Pure Oil Co. 1 Ward, T&NO Sur. 197, A-268. IP 2.75 BOPD and 77 M.c.f. daily, 3/32-in., 42.9°, perforations 8,672-76 ft., 8,678-80 ft., 8,682-86 ft., and 8,688-94 ft. TD 10,500 ft. (New reservoir 2½ miles northwest of La Belle field and 3½ miles southeast of Fannett field.)

Matagorda County: Russell Maguire and Humble Oil & Refining Co. 3-A Huebner, James Silvey Sur., A-382. IP 6,600 M.c.f. daily, open-flow potential, 41.1 BC per M.M.c.f., perforations 9,474-84 ft. and 9,486-98 ft. TD 9,850 ft. (New pay in Faith-Mag field.)

McMullen County: Amerada Petroleum Corp. 1 Craig, J. Poitevent Sur., A-366. IP 97,500 M.c.f. daily, open-flow potential, GLR 217 M.c.f. per bbl. (10 per cent condensate and 90 per cent water), open hole 13,066-14,479 ft. (Edwards lime). TD 14,479 ft. (Edwards discovery well northwest flank of Fashing field.)

SOUTH LOUISIANA

Beauregard Parish: Texas Gulf Producing Co. 2 Bayne, 34-6s-8w. IP 121 BOPD, 3/32-in, 45.4°, perforations 9,448-53 ft. TD 10,200 ft. (New field.)

Iberia Parish: Humble Oil & Refining Co. 40 Petit Anse, 55-13s-6e. IP 374 BOPD, ⅛-in., 39.1°, GOR 880 cu. ft. per bbl., perforations 15,476-96 ft. TD 15,539 ft. (New sand and segment at Avery Island —northwest flank.)

Lafourche Parish: Humble Oil & Refining Co. 1-Y L.L.&E., 46-17s-18e. IP 119.4 BOPD and 8,365 M.c.f. daily, ¼-in., 36.4°, perforations 12,415-23 ft. TD 12,753 ft. (New pay and extension at Lake Fields.)

WEST TEXAS

Coke County: C. L. Norsworthy, Jr., 1 Smith, Sec. 4, Winfield Scott Sur., 2 mi. N Edith. IPP 43 BOPD, 40°, GOR 820, Pennsylvanian 6,186-89 ft. TD 6,974 ft.

Dawson County: Tidewater Oil Co. 2 Stokes, 3-C39-PSL, 5 miles NW Welch. IPP 40 BOPD, 33°, GOR zero, pay 4,880 ft. TD 4,925 ft.

Gaines County: Jake L. Hamon et al 1 G. T. Randolph, Labor 12, League 285, Schleicher CSL, 18 mi. W Lamesa. IPP 51 BOPD, 39°, GOR 870, Mississippian 11,580 ft. TD 12,945 ft.

Hockley County: Huber & Wagner 1 White, Labor 21, League 704, State Capitol Lands Sur., 18 mi. NW Levelland. IPP 114 BOPD, 28°, GOR 245, San Andres 4,604-39 ft. TD 4,648 ft.

Irion County: Plymouth Oil Co. 1 Sugg, 14-6-H&TC, 15 miles NW Mertzon. IP 481 BOPD, ½-in., TP 100 psi., GOR 547, 38°, Wolfcamp, 5,890-5,912 ft. TD 8,091 ft.

Stanolind Oil & Gas Co. 1-E Sugg, 69-14-H&TC, 21 mi. W Mertzon. IP 154 BOPD, 22/64-in., TP 25 psi., GOR zero, 29°, San Andres 1,890-1,900 ft. TD 4,890 ft., PB 1,927 ft.

Pecos County: Charles H. Wacker 1 Breen, 56-10-H&GN, 12 mi. SW Imperial. IP 184 BOPD, 16/64-in., 39°, TP 375 psi., GOR 1550, Devonian 5,176-5,214 ft. TD 5,574 ft.

Runnels County: Humble Oil & Refining Co. 1 Underwood, L. Martin Sur. 441, 5 mi. NE Morton. New pay in North Norton field. IP 186 BOPD, 16/64-in., 47°, GOR 855, TP 380 psi., Gray sand 4,764-83 ft. TD 4,735 ft.

Winkler County: Humble Oil & Refining Co. 1 Waddel Bros., 2-40-PSL, 11 mi. E Kermit. IP 404 BOPD, ¼-in., TP 495 psi., GOR 740, 34.5°, Devonian 9,186-9,208 ft. TD 11,432 ft., PB 9,265 ft.

Stanolind 3 Hendrick T-89-B, 35-B5-PSL, 3 mi. NE Wink. Dual completion, calculated potentials: Devonian pay 9,110-60 ft., IP 74,000 M.c.f. gas, GOR 127,-300:1, 64°, shut in CP 3,260 psi. Ellenburger 11,340-11,400 ft., IP 113,000 M.c.f., GOR 117,670:1, shut-in pressure 3,550 psi. TD 11,770 ft., elev. 2,824 ft.

WEST CENTRAL TEXAS

Fisher County: Ab-Tex Production Co. 1 Matchett, 183-1-BBB&C, 2 mi. N Hamlin. IP 266 BOPD, 16/64-in., TP 350 psi., GOR 650, 41°, top Canyon sand pay 4,124 ft. TD 5,435 ft.

West Central Drilling Co. 1 Barnes, Lot 28, Bastrop CSL, 2 mi. N Roby. IPP 168 BOPD, 38°, GOR 650, Swastika 3,962 ft. TD 5,420 ft.

Nolan County: C. L. Norsworthy, Jr., 1-B Compton, 53-1-A-H&TC, 9 mi. W Maryneal. IP 121 BOPD, ¼-in., TP 175 psi., GOR 670, 40°, Canyon pay 5,720 ft. TD 7,519 ft.

NORTH TEXAS

Baylor County: Oakland Corp. 2 Worley, 36-45-H&TC, 3½ mi. SE Bomarton. IPP 41.7 BOPD, 34°, GOR zero, pay 1,465-78 ft. TD 1,700 ft.

Clay County: Bridwell Oil Co. 1 Hoff, 67-2-Clark & Plumb, 5 mi. SE Windthorst. IPP 44 BOPD, 38°, GOR 315, pay 3,609-12 ft. TD 4,559 ft.

Russell Maguire 1 Dugger, Blk. 7, Halsell Subd. 1, 4 mi. E Halsell. IPP 83 BOPD, 38°, GOR zero, pay 4,874 ft. TD 5,490 ft.

McMahon-Bullington and The Chicago Corp. 1 Wetsel, TE&L Sur. 3274, A-635, 6 mi. NE Buffalo Springs. IPP 48 BOPD, 42°, GOR 150, Strawn 4,431-37 ft. TD 4,610 ft.

Cooke County: Standard Oil Co. of Texas 1 Evans, W. H. White Sur., A-1134, 20 miles NW Gainesville. IP 162 BOPD, 13/64-in., TP 200 psi., 37°, GOR 172, Beasley sand 6,514-34 ft. TD 6,609 ft.

Knox County: Throckmorton Oil Co. 1 City of Goree, 82-45-H&TC, ½ mi. E Goree. IPP 111 BOPD, 34°, GOR 100, pay 1,719-24 ft. TD 1,791 ft.

Tom Medders 1 Cloud, Sec. 6, H&TB Sur., 3 mi. SE Goree. IPP 25 BOPD, 35°, GOR 150, Tannehill sand 1,608-10 ft. TD 1,672 ft.

Wise County: Pan-Tex Drilling Co. 1 Elrod, R. D. Price Sur., A-675, 2 mi. W Alvord. IP 180 BOPD, 13/64-in., TP 430 psi., GOR 980, 44°, conglomerate 5,766-84 ft. TD 6,020 ft.

Young County: Warren Petroleum Corp. 1 McGee, TE&L Sur. 642, A-800, 4 miles SW Loving. IPP 52 BOPD, 38°, GOR 657, Mississippian lime 4,862 ft. TD 4,872 ft.

PARADE OF PROGRESS

the
story
behind

TIGER BRAND WIRE ROPE

AMERICAN STEEL & WIRE DIVISION
USS
TRADE MARKS
TIGER BRAND
WIRE ROPE
UNITED STATES STEEL

1831-1956
125
YEARS
PEOPLE · PROGRESS · PRODUCTS

Celebrating our 125th Anniversary

From Hoop Skirts . . . . .to

The first successful wire making enterprise in America was started in 1831 at Worcester, Massachusetts, and became known as Washburn and Moen. This firm produced wire for the woolen industry, for screws and nails and piano wire.

The first big boom in wire making came through a whim in fashion—the hoop skirt—and Washburn and Moen took full advantage of it. They became the leading wire producer in the nation and won a reputation for quality which they never relinquished.

In 1899, during the era of big mergers, Washburn and Moen, along with many other wire making plants, were incorporated into the American Steel and Wire Company of New Jersey, which soon became a part of the United States Steel Corporation.

A few years later, American Steel & Wire began to manufacture wire rope at Trenton, New Jersey and New Haven, Connecticut. This product was highly successful. Production expanded . . . and today American Steel and Wire is the largest producer of wire rope in the world, making more than 1,000 kinds and sizes.

Your closest contact with wire rope may be a daily ride in an elevator. You see it supporting the biggest suspension bridges, and digging coal on mammoth shovels. It is used on the deepest oil wells, on ships and steel mill cranes, for highway guard rails and logging cables. Wire rope and strand are the universal tools for pulling, hauling and transporting man, his goods and materials. Write for our book on Tiger Brand Wire Rope.

AMERICAN STEEL & WIRE DIVISION,
UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

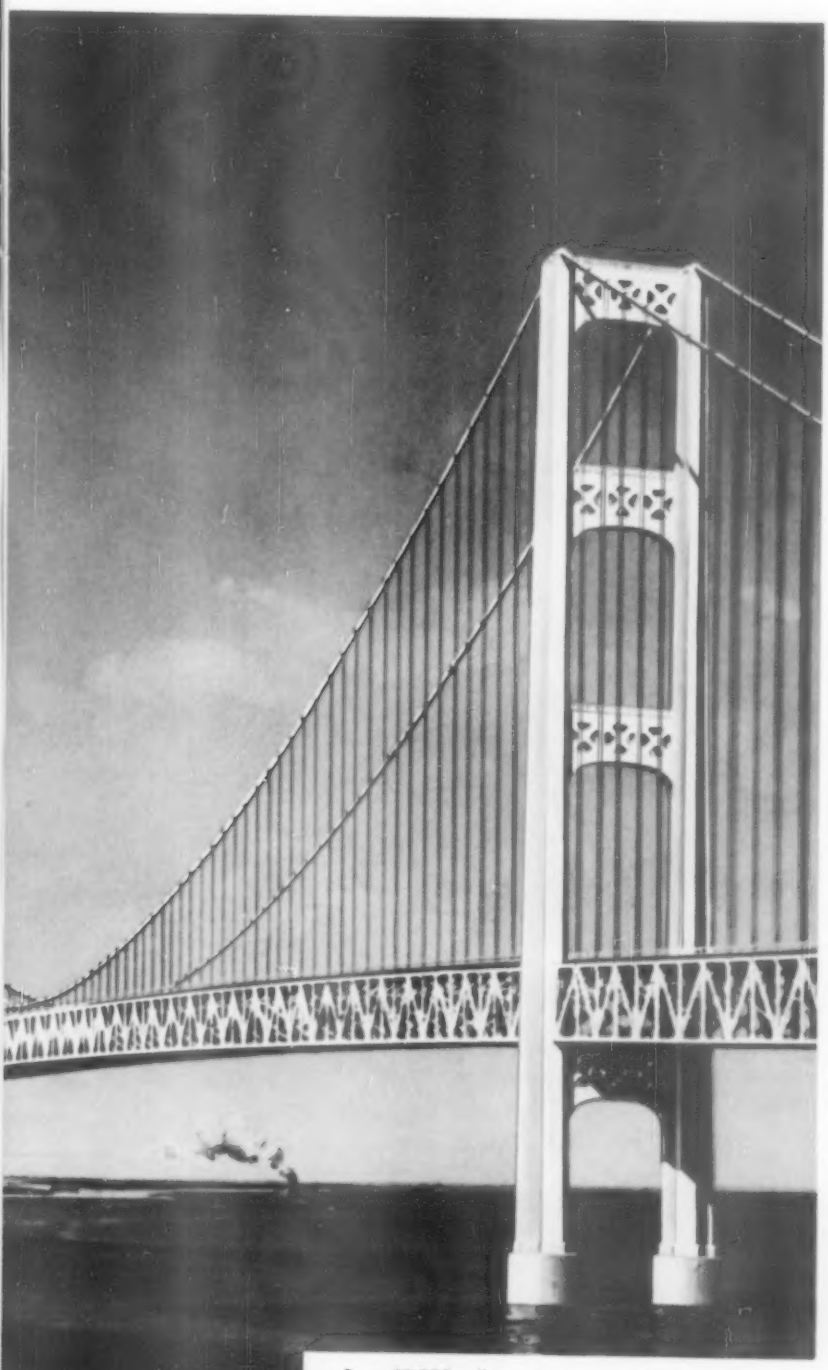
Wall of Stainless Steel Strand Tiger Brand in one of Chicago's new parking garages. American Steel & Wire springs provide the 1,000-lb. tension to keep the strand taut.

Drilling for Oil in the Gulf of Mexico with a new type of rig equipped with 5,000 feet of Tiger Brand Drilling Line.

USS

UNITED STATES STEEL

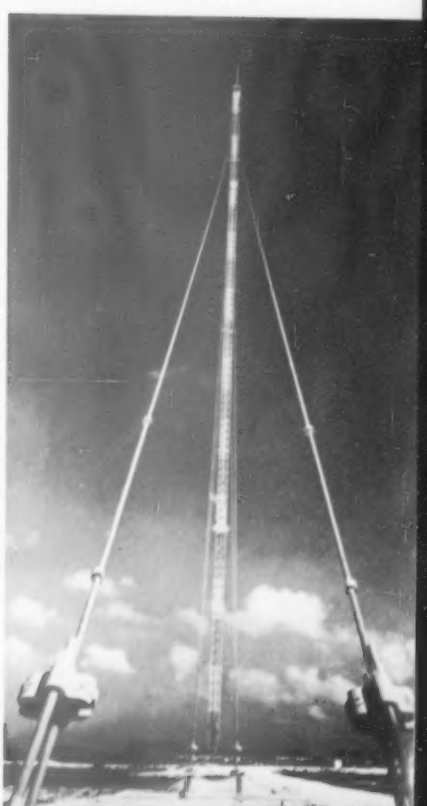
Suspension Bridges



Over 45,000 miles of wire products by American Steel & Wire will be used to complete the Mackinac bridge at St. Ignace, Michigan—longest suspension bridge in the world.

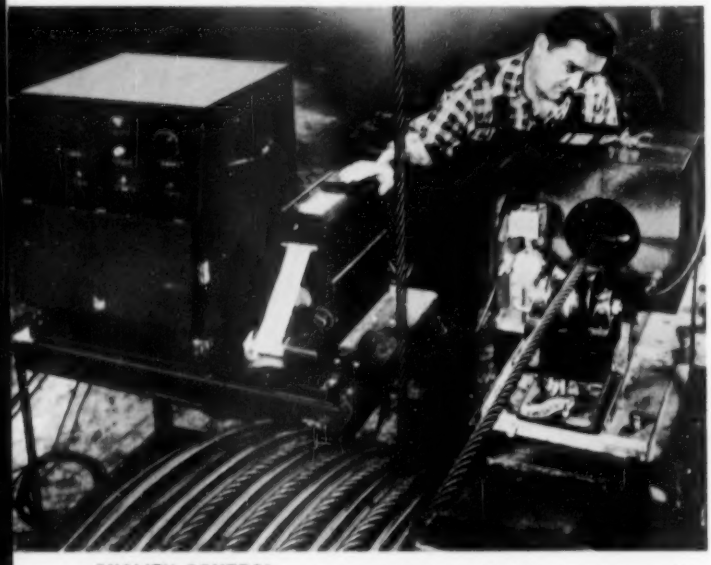
World's Largest Shovel scoops up 60 cubic yards in one bite. Tiger Brand Wire Rope provides the steel "muscles" that make it work.

Tall TV Tower for station WGBS-TV in Miami, Florida, must withstand high winds. It is supported by 1⅜" Tiger Brand galvanized strand.

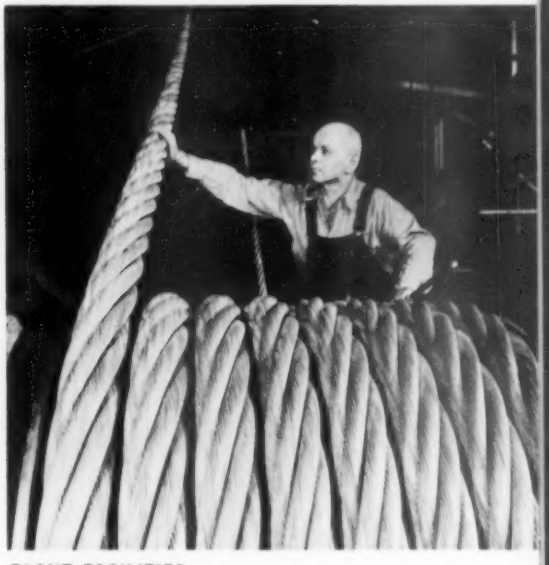


Why Tiger Brand leads . . .

RESEARCH AND ENGINEERING American Steel and Wire has built up one of the finest staffs of wire rope engineers in the country, and in addition can draw from any of the basic research being performed by the United States Steel Corporation. In practice, this means that Tiger Brand Wire Rope is made from the best materials and finest steel being produced. The rope construction is engineered to fit the job . . . and you get a rope that will give the most service at the least cost.



QUALITY CONTROL This means that specified standards of quality are maintained for every step of production from ore to finished product. You can be sure of getting the same high-quality wire rope time after time. The illustration shows an electronic inspection machine, exclusive with American Steel & Wire, that detects if a wire rope imperfection exists, records it on a chart and marks the spot on the rope.



PLANT FACILITIES These are unsurpassed in the industry. American Steel & Wire can make any type and size of wire rope and strand up to the large 4-inch pre-stressed suspension ropes shown here. These ropes are being used on the Pennsylvania-New Jersey Turnpike bridge.

USS AMERICAN TIGER BRAND WIRE ROPE

UNITED STATES STEEL

USS

Titles come in bunches as . . .

Weyland Makes Second Climb

A H. WEYLAND, newly elected president of the Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, has started his second climb up the ladder in a company which he formerly served as president.

The Shreveport executive resigned as chairman of the board of Arkansas Louisiana Gas Co. last March 1. A few weeks later he went as a consultant to Arkansas Fuel Oil Corp., from which he had resigned in 1953 after serving several years as president.

In two quick strides he has risen from consultant to manager of the production division to vice president. During the past 6 months, on his second trip up the ladder, he has skipped several rungs on which many men spend half a lifetime.

Titles aplenty . . . Titles don't mean much to Weyland, who has served as president of at least five companies in the oil, gas, and pipeline industries. But they still come to him in bunches.

His latest promotion in the company came September 20. The following day he was elected 1957 president of the Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association.

At the closing session of the Mid-Continent meeting in New Orleans he was far busier trying to line up friends to go dove hunting than in trying to line up votes for the presidency.

"We're letting this business interfere with something that's important," he complained. Dove season was opening that same day, and he was 320 miles from his favorite hunting grounds near Shreveport.

Cities Service man . . . Weyland's career has been closely tied to Cities Service Oil Co. and its affiliates. He will be 58 years old this month, and the 35-year pin which he wears in his lapel indicates most of that time has been spent in the Cities Service family.

Born in California, he attended Texas A. & M. College, where he received his B.S. degree in electrical engineering in 1919.

After "about 2 days' vacation" he went to work at Bartlesville, Okla., as a junior engineer for Empire Companies, predecessor of Cities Service.

After switching to Natural Gas & Fuel Co. as district superintendent, he transferred to Shreveport in 1928 as superintendent of oil production for Arkansas Fuel Oil Co. Five years later he was named general superintendent in charge of all operations of Arkansas Natural Gas Corp. and subsidiaries.

Promoted to vice president of Arkansas Louisiana Gas Co. in 1936, he later become vice president and general manager of Arkansas Natural and president of four subsidiaries—Arkansas Louisiana Gas Co., Arkansas Fuel Oil Co., Arkansas Pipeline Corp., and Orange State Oil Co.

When Arkansas Louisiana Gas Co. was separated from Arkansas Natural Gas Corp. and Arkansas Fuel Oil Co. in 1953, Weyland continued as president of the gas company. He later became board chairman.

His recent transfer back to Arkansas Fuel Oil meant returning to the production business which he admits he "used to know something about." It also meant returning to a Cities Service affiliate.

Weyland is married to the former Miss Helen Duffy, of Okmulgee, Okla. They have two sons, James H. and Charles D.

Thomas A. Parks, senior geologist for Sohio Petroleum Co., and **Victor M. Naimish,** senior landman, have both been transferred from Regina to Calgary. **John S. Ambler** has been promoted to senior geologist to replace Parks at Regina, and **A. Ross Long** will replace Namish as landman there.

E. R. (Bob) Swift, West Texas area engineer for Sunray Mid-Continent Oil Co., has joined Mesa Petroleum Co., Inc., as chief production engineer. Swift is a graduate of the University of Tulsa with a degree in production engineering. He will supervise Mesa's waterflood program in the Texas Howard-Glasscock field.

Personals

Ed J. Bartosh, geologist and engineer with Bankline Oil Co. in Los Angeles, has opened his own consultant offices there.

John Traut, Robert Near, and **William Heine,** geologists with Ohio Oil Co., have been transferred from Sidney, Mont., to Bismarck, N. D.

Vernon J. Hunzicker, seismologist with Petty Geophysical Engineering Co. in San Antonio, Tex., has joined Texas Gulf Producing Co. in Houston as geophysicist.

J. J. (Jerry) Wright, senior development geologist for The California Co. in New Orleans, has resigned to join Coronet Oil Co. Wright will open a Gulf Coast exploration office for Coronet in Lafayette, La.

Frank W. Abrams, former chairman of the board of Standard Oil Co. (N.J.), has received an award for distinguished service to higher education. The award was made in New York by the Empire State Foundation of Independent Liberal Arts Colleges. Abrams retired from Jersey Standard in 1953.

L. C. Ritts, division geologist for Stanolind Oil & Gas Co. in Houston, has been promoted to division exploration superintendent. He succeeds **W. C. Imbt,** who has been transferred to Albuquerque. **T. D. Barber,** Houston district exploration superintendent, will succeed Ritts as division geologist.

O. V. Tracy, a director of Esso Standard Oil Co., has been elected a vice president of the company with responsibility for both the manufacturing and chemical products departments. A graduate of the United States Naval Academy, Tracy has been with Esso Standard since 1930. He has been a director of the company since 1954. During the Korean War he served as director of the chemical division of the National Production Authority.

Harold M. Seeley, district geologist for Seaboard Oil Co. in Corpus Christi, Tex., has been transferred to Dallas as supervisor of the Gulf Coast area. **Robert W. Luker,** formerly of the company's Dallas office, will succeed Seeley at Corpus Christi.

Personals

John L. Gere, chief engineer for Cities Service Gas Co., Oklahoma City, **R. W. Hofsess,** manager of the company's production and supply department, and **Burton F. Wiand,** manager of public and industrial relations, have been elected directors of the company. Gere joined Cities Service Gas in 1927. He has been chief engineer since 1953. Hofsess, who is also a director of Cities Service Gas Producing Co., a subsidiary, has been with Cities Service since 1933. Wiand has held his position as head of public relations since 1952.

J. L. GERE

R. W. HOFSESS

Wilson Garrison, of Garrison-Begert Drilling Corp., has bought the interest of his partner, **C. G. Begert,** and formed the Garrison Drilling Corp., in Princeton, Ind.

W. W. Jones, formerly with Don Slape Drilling Co., has formed the Woody Jones Drilling Co. in Olney, Ill.

Richard J. Harwood, general manager of Oil Production Equipment Rental, Inc. (O.P.E.R.), has joined Rocket Drilling Co., Wichita, as division exploration manager. **William Peterson** has been named Wichita division geologist for Rocket, replacing **James Thompson,** who has resigned to open consulting offices in Wichita, Kans.

Frank R. Roberson, farm boss with Stanolind Oil & Gas Co., has been transferred from Brush, Colo., to Worland, Wyo.

Clare H. Zachry, president of Southern Union Gas Co., Dallas, was elected president of the American Gas Association at its thirty-eighth annual convention last week. Other officers are **A. W. Conover,** president, Equitable Gas Co., Pittsburgh, first vice president; **Robert W. Otto,** chairman of the board, Laclede Gas Co., St. Louis, second vice president; **Vincent T. Miles,** treasurer, Long Island Lighting Co., Mineola, N. Y., treasurer.

Robert Evans has been named geologist for Jet Oil Co. in Sparta, Ill.

W. Pat Simmons, formerly with Joseph Teichman in Tulsa, has resigned to become an independent operator in Wichita, Kans.

R. G. Anderson, geophysicist with Standard Oil Co. of Texas, has been promoted and transferred from Fort Stockton, Tex., to Midland, Tex.

V. E. Wellman has been appointed manager of the New York petrochemicals department of American Cyanamid Co.

T. R. (Tom) Barnes, senior geologist with Shell Oil Co. in New York, has been transferred to Midland, Tex.

James Dale Peterson, recent graduate of the University of Minnesota, has joined the staff of the North Dakota Geological Survey.

John C. Wyeth, geologist with Continental Oil Co., has been transferred from Salt Lake City to New Orleans.

R. D. Rogers, vice president and executive assistant to the eastern division general manager of Tidewater Oil Co., has retired. Rogers has been with Tidewater for 36 years. He will continue to act as consultant for the eastern division.

Bert I. Lebow has been named manager of a new district office opened at Owensboro, Ky., by **Simon Lebow,** Tulsa independent operator.

A. F. Sundermeyer, mechanical engineer for Shell Oil Co. in Oklahoma City, has been transferred to Wichita.

Dr. Griffin D. Jones, assistant director of Dow Chemical Co.'s physical research laboratory, has been appointed director. He succeeds **Dr. W. C. Bauman,** who has been named director of research for the company's chemicals department. Jones has been with Dow since 1947.

Alex Boardman has been appointed head of exploration activities in the Denver Julesburg basin by British-American Oil Producing Co. **Jim Rucker** will hold a similar position in the San Juan basin as will **Larry Yeager** in the Paradox basin. **Penn Gooldy** has been named special projects geologist for the company's Rocky Mountain division, and **Carl Brown** has been appointed exploration geologist for the Denver Julesburg basin. **Bob Walker** will be assistant Rocky Mountain division exploitation geologist.

Albert A. Kirkbride has joined Sohio Petroleum Co. as Houston district geophysicist.

Russell J. Alexander, geologist with The California Co., has been transferred from Pensacola, Fla., to Jackson, Miss.

D. S. Yielding, district manager for Continental Oil Co. in Oklahoma City, has been transferred to Enid, Okla. **E. L. Hilliard,** Enid district manager, has transferred to Oklahoma City as assistant division manager.

W. G. Stewart has been appointed Australian staff manager for Shell Oil Co. of Australia, Ltd. Stewart has been with the company since 1935. He succeeds **D. A. Whitehead.**

Milton D. Crane has been appointed assistant director of research for Consolidated Natural Gas Co. He will also head research activities of Peoples Natural Gas Co., a subsidiary of Consolidated.

Robert E. Hornberger, president of Caribbean Oil Corp., has been elected to the board of directors of LeCuno Oil Corp., Jefferson, Tex. He succeeds **Erwin C. Ford** of Houston, who has retired.

Foster L. Thornton, development engineer with Shell Oil Co., has been transferred from Bakersfield, Calif., to Ventura, Calif. **Arthur Spaulding,** development engineer with the company at Ventura, has been transferred to the area office in Los Angeles.

C. N. BROOKS

C. N. Brooks, manager of The Texas Co.'s southern territory, domestic sales department, has been named general manager of foreign operations. Brooks joined Texaco in 1928. He was division manager for the company at Houston and later at Atlanta before taking over his position as southern territory manager in 1953. Brooks succeeds **Harvey Cash** who has been named assistant to the chairman of the board.

Wayne E. Swearingen has been named chief engineer of Alex W. McCoy Associates, Inc., Tulsa geological consulting firm. A graduate of the University of Oklahoma, Swearingen was formerly with Stanolind Oil & Gas Co. and Herman Kaveler, Tulsa.

R. M. SEBASTIAN

R. M. Sebastian, assistant general manager of Atlantic Refining Co. of Brazil, has been appointed general manager. He succeeds **C. W. Nave,** who has retired. Nave has been head of the company's operations in Brazil since 1927. He joined the company in 1921. Sebastian, a graduate of the University of Pennsylvania, has been with Atlantic since 1944. He served as resident counsel of Venezuelan Atlantic Refining Co., a subsidiary, and in the company's Philadelphia headquarters before going to Brazil in 1955.

Charles Henry Martin, assistant production foreman for Gulf Oil Corp., has been transferred from Lindsay, Okla., to Casper, Wyo.

E. B. Noble, petroleum consultant, has joined **E. Fred Davis** and **E. W. Masters** in consulting offices in Los Angeles.

Nises Armstrong, district supervisor for the New Mexico Oil Conservation Commission in Artesia, N. M., has been made coordinator of field operations in the Roswell-Artesian basin area.

Dr. E. M. McNatt, assistant manager of the geophysical division of Carter Oil Co.'s Tulsa exploration department, has been named geophysical adviser in the exploration department in the New York City office of Standard Oil Co. (N. J.). **Marvin Romberg,** Denver, has been transferred to Carter's Tulsa offices to replace McNatt.

T. S. Llewellyn, assistant master mechanic for Service Pipe Line Co., has been appointed senior engineer of the company's engineering department. Llewellyn has been with Service Pipe Line since 1937. He as a graduate of the University of Oklahoma. Llewellyn succeeds **W. L. Kennedy, Jr.,** who has resigned to join Bechtel Corp. in San Francisco.

Maxwell W. Balfour, vice president of Spartan Aircraft Co.; **W. K. Bullock,** president and general manager of Minnehoma Financial Co.; and **Barnabas B. Hadfield,** attorney with Leve, Hecht, Hadfield & McAlpine of New York City, have been elected directors of Skelly Oil Co. They succeed **Emil Kluth** and **S. E. Cavenaugh** of Los Angeles, and **C. C. Herndon,** Tulsa, former executive vice president who has retired.

E. E. Duncan, production superintendent with Plains Exploration Co., has been transferred from Stafford, Kans., to Hutchinson, Kans.

James A. Latham, petroleum engineer with Arkansas Fuel Oil Corp., has been transferred from Alice, Tex., to Shreveport, La.

James M. Reed, toolpusher for Reed Drilling Co., has been promoted to drilling superintendent for the company in Okemah, Okla.

H. C. Lyles, utilities foreman at Humble Oil & Refining Co.'s Baytown, Tex., refinery, has been promoted to general foreman of the utilities department. A graduate of Louisiana State University, Lyles has been with Humble since 1939.

Hugh D. Miser, veteran U. S. Geological Survey geologist, has been elected to honorary life membership in the Oklahoma City Geological Society. He is the only non-Oklahoman to be so honored.

Personals

William F. Yerington, geologist with the Ohio Oil Co. in Olympia, Wash., has been transferred to Coalinga, Calif.

W. S. McAllister, area geologist with Stanolind Oil & Gas Co., has been transferred from Lake Charles, La., to Lafayette, La.

S. G. Weeks, district exploration engineer for Shell Oil Co., has been transferred from Oklahoma City to Woodward, Okla.

H. R. Willis, exploitation engineer for Shell Oil Co., has been transferred from Elk City, Okla., to Woodward, Okla.

Donald L. Hendrickson, chemical engineer with General Petroleum Corp. in Torrance, Calif., has joined Socony Mobil Oil Co. as chemical engineer in New York City. General Petroleum is an affiliate of Socony Mobil Oil.

Press Award to Indiana Standard

HANDLING of news of the Whiting, Ind., refinery disaster by Standard Oil Co. (Ind.) has won the company the annual Public Relations News achievement award.

Dr. Robert E. Wilson, chairman of the board of Indiana Standard (left) received the award from Denny Criswold (right) New York City editor and publisher of the Public Relations News. The company was cited for "an enlightened public relations policy of frank and full communication of news, a policy which left in the wake of the Whiting refinery disaster increased confidence and respect on the part of the company's publics and the press."

Personals

C. A. A. Gogg, deputy minister of mineral resources in Saskatchewan, has been named chairman of the Saskatchewan Oil and Gas Conservation Board.

M. A. Ellsworth, vice president and general manager of Fluor Corp.'s engineering and construction division, has been named a director of the company. Ellsworth joined the Fluor Corp. in 1940. He was named vice president of sales in 1952, and has held his position in the engineering and construction division since 1955. Ellsworth is a graduate of Oklahoma A. & M. College.

John F. Tolleson, geologist and director of Molasse Erdolforderungs A.G. (Mofag) in Zurich, Switzerland, has resigned to open geological consulting offices in Zurich. He will specialize in photogeology in Europe and Africa.

Allen L. Barnes, petroleum engineer with Magnolia Petroleum Co., has been transferred from Lindsay, Okla., to Duncan, Okla.

Gerald S. Tompkins, president of American Viscose Corp., has been elected to the board of directors of the Chemstrand Corp. He succeeds Dr. **Charles S. Venable,** former director of chemical research for American Viscose, who has retired.

C. J. Bitzer, sales manager of the alcohols and chemicals division with Esso Standard Oil Co., has been appointed head of the chemical products section, marketing coordination department, for Standard Oil Co. (N. J.). He will be in charge of market development work in petrochemicals. A graduate of M.I.T., Bitzer has been with Jersey Standard and its affiliates since 1928.

Charles J. Wrightsman, Fort Worth independent and pioneer Oklahoma oil man, has received the John Carroll Award of Georgetown University. The award is made annually to one or more outstanding alumni. Wrightsman moved to Tulsa in 1906, and later helped open Cushing field near Drumright, where he founded Wrightsman Petroleum Co. He was one of the founders of the Mid-Continent Oil and Gas Association. He is a former director of the association.

Thomas Baron, assistant head of the chemical engineering department in Shell Development Co.'s Emeryville, Calif., research center, has been promoted to head of the department. A graduate of the University of Illinois, Baron joined Shell in 1951.

James R. Britt, formerly with Fabricated Steel Products Co. and before that with Cities Service Oil Co., has been appointed manager of the chemical plants division of Procon, Inc.

J. C. Chappell, formerly general superintendent for Perkins Oil Co. in Olney, Tex., has joined Northwest Oil Co. in the same capacity. He will supervise production and drilling in Oklahoma and Texas.

A. J. MacMillan, district geologist for The Texas Co. in Bakersfield, Calif., has been named senior geologist in Los Angeles. **Richard B. Palmer,** geologist in Los Angeles, has been transferred to Bakersfield to replace MacMillan. **Elton L. Oliver,** field engineer for the company in Santa Paula, Calif., also has been transferred to Bakersfield.

M. F. Westfall, production superintendent of Husky Oil Co., has been promoted to manager of operations. Westfall has been with Husky since 1952. He was formerly with Cities Service Oil Co. **James R. Learned,** attorney for the company, has been named manager of land and exploration. A graduate of the University of Wyoming, Learned holds degrees in both law and geology.

Wayne Granger has joined Tidewater Oil Co. as a geologist in Casper, Wyo.

J. W. Vidrine, production engineeer with American Trading & Production Corp., has been transferred from Abilene, Tex., to Bridgeport, Tex.

A. H. Silberberg, petroleum engineer with D. D. Feldman Oil & Gas Co., has joined Malcolm K. Brachman and Northwest Oil Co. in Dallas as petroleum engineer.

Forrest Cave, manager of the crude-oil division of National Cooperative Refinery Association at Wichita, has resigned to become an independent operator.

Reese H. Taylor, chairman of the board of Union Oil Co. of California, has been elected a director of Westinghouse Electric Corp.

Roy C. Gould, engineer in Sohio Petroleum Co.'s Mid-Continent division, Oklahoma City, has been promoted to senior engineer and transferred to Calgary.

K. G. Smith, assistant district superintendent of Interstate Oil Pipe Line Co.'s Magnolia, Ark., district, has been named superintendent. He succeeds the late J. L. Copeland. Smith has been assistant superintendent at Magnolia since September. He was previously district foreman in Interstate's Brookhaven, Miss., district.

DEATHS

William H. (Alfalfa Bill) Murray, 86, ninth governor of Oklahoma, died October 15 in Oklahoma City. One of the high points during Murray's stormy term of office was the 1931 declaration of martial law in an effort to shut down the state's oil fields. The National Guard kept wells closed until the price of oil rose from 20 cents to $1 a barrel.

Walter S. Byrne, 67, president of Seattle Gas Co. and Washington Natural Gas Co., died recently in Seattle. Byrne, formerly chief executive officer of the Metropolitan Utilities district of Omaha, joined Seattle Gas in 1955 after retiring.

Woodward A. Warrick, 63, retired manager of the sales engineering division of Diamond Chain Co., died September 25 in Indianapolis. Warrick was formerly experimental and mechanical engineer for the company.

Ellwood Clark, 86, retired executive of the old Socony Vacuum Oil Co., died October 15 in White Plains, N. Y. Clark was for many years secretary to the president and chairman of the board of Socony. He joined the company in 1889 when it was known as Standard Oil Co. of New York. He retired in 1935.

Guy A Wainwright, 66, chairman of the board of Diamond Chain Co., and formerly president of the company, died suddenly in Indianapolis recently.

David S. Faulkner, 70, retired vice president of National Supply Co. and one of the founders of the Petroleum Equipment Suppliers Association, died October 11 in Los Angeles.

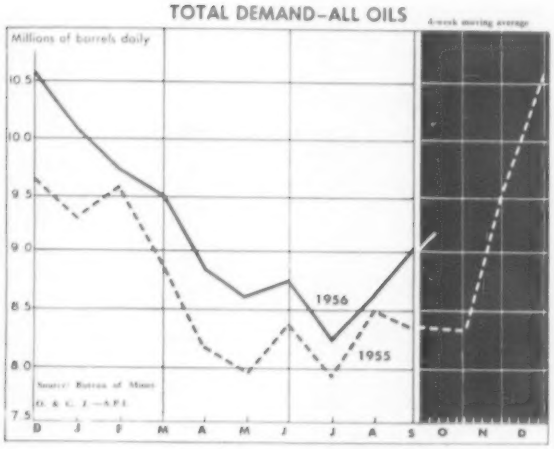
Nichols McCaleb, 55, independent Houston oil operator, died October 12 in Houston.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,006,875	DOWN	47,800	UP	176,845
Crude stocks	276,967,000	DOWN	1,689,000	UP	21,981,000
Completions	1,103	DOWN	17	DOWN	46
Refinery runs	7,498,000	DOWN	199,000	UP	141,000
Gasoline stocks	174,062,000	DOWN	1,938,000	UP	23,582,000
Kerosine stocks	33,564,000	UP	321,000	DOWN	3,664,000
Distillate stocks	153,199,000	UP	1,394,000	UP	4,350,000
Residual stocks	47,349,000	UP	50,000	UP	61,000
Four-product stocks	408,174,000	DOWN	173,000	UP	24,329,000
Total imports	1,193,300	DOWN	294,900	UP	190,200

TOTAL DEMAND—ALL OILS



August-September Demand Changes Are Abnormal for Both 1955 and 1956

SUMMER demand curves for both 1955 and 1956 vary somewhat from the typical curve, and in some cases the variations are in the opposite directions.

These differences account for the big increase in total demand for September over the same month last year. For the period 1950-55, total demand for September averaged about 0.5 per cent more than demand in August. Note that September demand last year was down from August, about 1.3 per cent. Most of this drop was due to unusual shifts by gasoline and residual fuel.

September gasoline demand normally is down slightly from August. The drop of 156,000 bbl. daily last year was the result of both high demands in August and subnormal demand in September.

Residual demand normally takes a seasonal upturn in September but decreased 89,000 bbl. daily last year between August and September.

The decline in gasoline demand from August to September this year was only 58,000 bbl. daily, based on current weekly figures. Middle-distillate demand increased about 360,000 bbl. daily from August to September, the largest August-September gain since the end of World War II.

Estimated September demand for residual fuel represents an increase of a little over 100,000 bbl. daily over August, much larger than the postwar average.

Part of the low gasoline demand in August this year probably was due to a reduction in secondary stocks by jobbers who were expecting a price decrease because of high primary inventories.

Current figures indicate that middle-distillate demand in August was no higher than last year and that residual demand was down slightly from August 1955.

Gasoline markets weaken despite cuts in runs . . . Basic contract prices for gasoline were cut in the Group 3 area in the second week of October. Spot prices for gasoline followed the downward trend.

Spot regular gasoline on the Group 3 market was selling at 11.50 cents a gallon or 0.25 cent under the basic contract price before the end of last June. Another 0.25-cent reduction developed by the end of August with no change in contract prices.

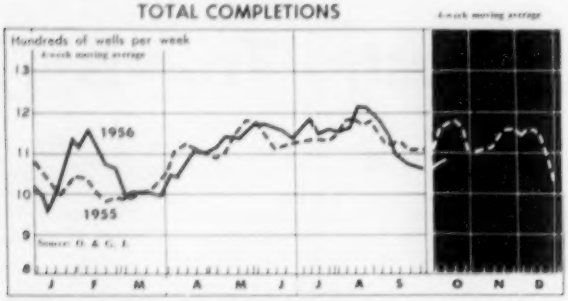
Before the contract base price was reduced in the second week of October, there was a differential of 0.5 cent between spot prices and contract base prices. When contract prices were reduced 0.25 cent, some of the Mid-Continent suppliers continued the 0.5-cent spread between contract and spot. A spot-buying jobber now can purchase regular gosoline on the Group 3 market at 11.00 cents a gallon. Delivered price at pipeline terminals will be 11.00 cents plus pipeline charges.

Formal market quotations for gasoline on the Gulf Coast are down, effective October 17. However, these reductions are no more than formal recognition of prices that have existed as spot prices since about the middle of August.

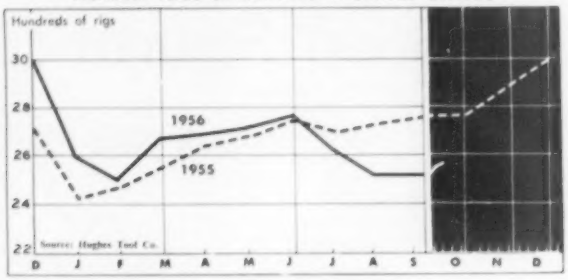
Distillate prices are stronger in the Mid-Continent. No. 2 fuel is selling for 9.00 cents a gallon on the Group 3 spot market compared with 8.75 cents a week ago.

Demand for residual fuel is good, but high tanker rates are hurting cargo sales on the Gulf Coast. Capacity operation by steel mills is helping create a good demand for low-sulfur resid in the Mid-Continent and North Central areas.

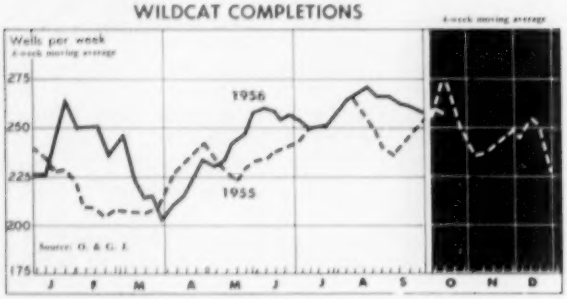
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	10-15-56	10-8-56	10-17-55
North Central and East	129	129	132
Southeast	44	41	38
Okla., Kans., Ark., Mo.	467	468	541
Louisiana	421	425	404
North and East Texas-Panhandle	373	355	403
Gulf and South Texas	239	249	250
West Texas-New Mexico	506	500	551
Rocky Mountain	267	274	306
Pacific Coast	119	115	143
Total	2,565	2,556	2,768
Western Canada	236	248	211

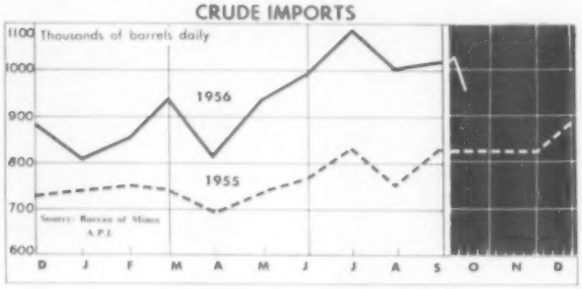
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 13, 1956

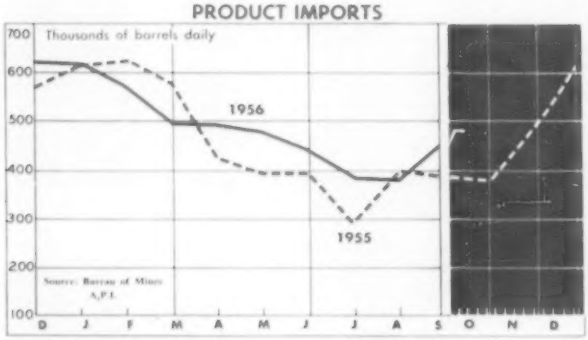
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	2	0	0	22,820	84	63	0	0	0	0	0	0	0	1	35	36
Arkansas	18	13	0	5	47,907	723	632	1	0	0	2	3	29	0	4	116	149
California	32	24	2	6	143,687	1,748	1,945	1	0	0	3	4	43	0	9	361	413
Colorado	25	4	3	18	132,067	946	1,188	1	0	1	10	12	22	0	13	467	502
Illinois	92	36	6	*50	195,809	3,064	3,063	3	0	0	19	22	43	0	3	557	603
Indiana	10	7	0	3	17,903	537	576	0	0	0	0	0	14	0	1	93	108
Kansas	101	42	9	*50	348,651	3,946	3,960	3	0	1	18	22	100	2	31	714	847
Kentucky	51	23	6	22	80,802	1,481	1,223	2	0	0	7	9	34	0	1	308	343
Louisiana	48	23	8	17	346,686	2,995	3,159	4	1	0	6	11	92	46	48	415	601
North	24	12	5	7	92,577	1,305	1,641	2	0	0	2	4	25	2	3	169	199
South	23	11	3	9	240,450	1,362	1,518	2	1	0	4	7	55	39	32	216	342
Offshore	1	0	0	1	13,659	328		0	0	0	0	0	12	5	13	30	60
Michigan	12	8	1	3	30,642	349	426	1	0	1	3	5	8	0	2	126	136
Mississippi	6	4	0	2	42,517	350	352	0	0	0	2	2	13	1	1	155	170
Montana	11	7	0	4	50,048	360	298	0	0	0	2	2	10	0	1	119	130
Nebraska	17	6	0	11	95,427	770	678	0	0	0	5	5	32	0	1	341	374
New Mexico	27	4	19	4	111,062	1,491	1,332	3	0	0	2	5	40	0	8	156	204
Northwest	23	2	19	2	96,943	660	446	1	0	0	1	2	9	0	7	54	70
Southeast	4	2	0	2	14,119	831	886	2	0	0	1	3	31	0	1	102	134
North Dakota	5	2	0	3	34,201	206	202	0	0	0	1	1	8	0	0	53	61
Ohio	32	19	6	†7	75,381	838	956	0	0	0	0	0	2	0	2	6	10
Oklahoma	132	79	8	‡45	418,497	6,593	6,705	1	0	0	10	11	100	17	31	549	697
Pennsylvania-New York	5	0	5	0	14,966	744	1,208	0	0	0	0	0	0	0	9	11	20
Texas	444	272	13	159	1,771,916	17,458	15,947	11	0	4	88	103	589	31	147	3,676	4,443
Southwest (1 & 4)	74	34	5	35	285,399	2,490	2,456	0	0	3	27	30	108	6	50	695	859
Gulf Coast (2 & 3)	43	18	2	23	270,855	2,073	1,979	1	0	1	15	17	54	16	52	566	688
East (5 & 6)	25	10	2	13	131,954	917	777	0	0	0	10	10	13	2	5	307	327
N. Central (7-B & 9)	169	97	0	72	434,068	6,273	6,005	4	0	0	29	33	259	0	11	1,477	1,747
West (7-C & 8)	112	98	1	13	565,854	4,670	3,901	5	0	0	4	9	139	0	10	577	726
Panhandle (10)	21	15	3	3	83,786	1,035	829	1	0	0	3	4	16	7	19	54	96
Utah	1	1	0	0	5,832	99	77	1	0	0	0	1	5	0	4	50	59
West Virginia	11	2	8	1	31,966	528	514	0	0	1	0	1	0	0	10	9	19
Wyoming	21	8	2	11	79,820	681	678	0	0	1	10	11	14	0	9	181	204
Miscellaneous	0	0	0	0	0	70	47	0	0	0	0	0	4	0	0	59	63
Total U. S.	**1,103**	586	96	421	4,098,607	46,091	45,229	32	1	9	188	**230**	1,202	97	336	8,557	10,192
Total previous week	1,120	569	80	471	4,620,105			22	5	9	231	267	1,170	96	327	8,369	9,962
Total Oct. 15, 1955	1,149	602	77	470	4,579,975			35	6	5	205	251	1,300	170	284	7,956	9,710
Cumulative 1956	46,091	24,881	3,180	18,030	185,535,939												
Western Canada	76	55	6	15	355,871	2,487											

Service wells included: *1, †2, ‡8.

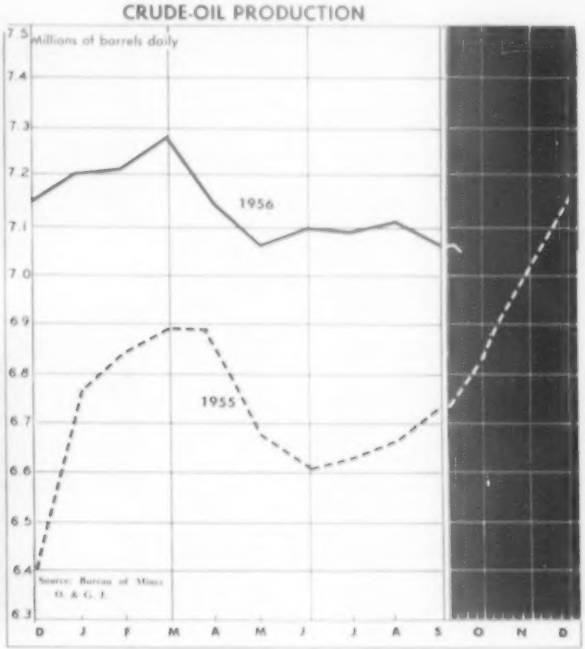
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

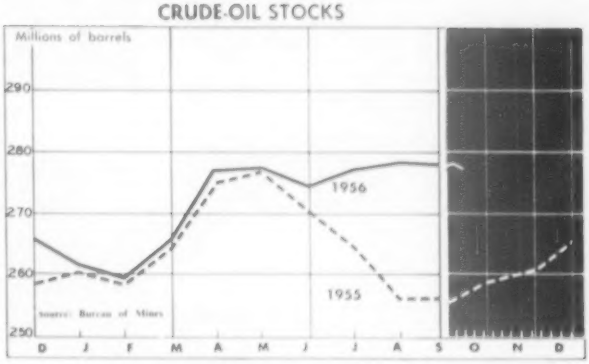


DAILY AVERAGE PRODUCTION FOR WEEK

	October 13, 1956			Oct. 6
	Crude oil	Lease condensate	Total	total
Alabama	10,000		10,000	9,900
Arkansas	77,350	350	77,700	77,500
California	956,800		956,800	959,300
Colorado	157,000		157,000	160,250
Eastern	50,700		50,700	51,200
Florida	1,375		1,375	1,300
Illinois	237,400		237,400	238,500
Indiana	32,400		32,400	31,900
Kansas	336,200		336,200	338,700
Kentucky	46,900		46,900	47,200
Louisiana	736,300	63,500	799,800	796,925
North	118,800	2,000	120,800	119,350
South	617,500	61,500	679,000	677,575
Michigan	28,300		28,300	28,300
Mississippi	108,950	4,700	113,650	113,625
Montana	61,250		61,250	62,000
Nebraska	37,900		37,900	38,700
Nevada	200		200	200
New Mexico	241,500	3,700	245,200	243,875
North Dakota	35,200		35,200	35,500
Oklahoma	†558,600		†558,600	†586,850
Texas	2,876,000	51,900	2,927,900	2,938,750
Dist. 1	56,000	500	56,500	56,500
Dist. 2	141,000	8,100	149,100	149,675
Dist. 3	410,000	24,500	434,500	437,075
Dist. 4	227,000	6,200	233,200	235,475
Dist. 5	41,000	450	41,450	41,875
Dist. 6	121,000	5,900	126,900	127,750
East Texas field	196,000		196,000	197,725
Dist. 7-B	158,000	50	158,050	158,325
Dist. 7-C	170,000	3,900	173,900	176,750
Dist. 8	1,043,000	1,600	1,044,600	1,043,750
Dist. 9	211,000	500	211,500	212,075
Dist. 10	102,000	200	102,200	101,775
Utah	4,900		4,900	5,100
Wyoming	287,400		287,400	289,000
Others	‡100		‡100	‡100
Total U. S.	6,882,725	124,150	**7,006,875**	7,054,675
Change from prev. week, down			**47,800**	
Canada	†453,800		†453,800	†488,500
Total U. S. prod., January 1-October 13			2,047,917,850 bbl.	
Same period last year (crude plus cond.)			*1,929,374,241 bbl.	

*Includes 32,131,600 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



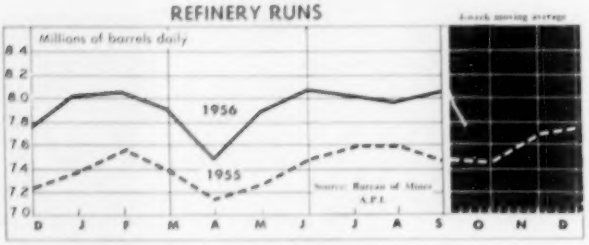
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

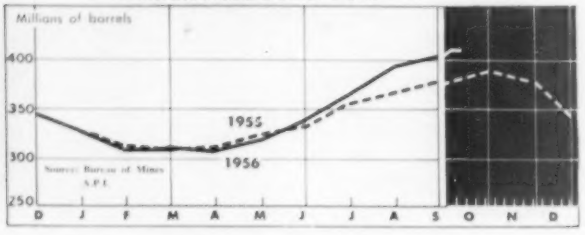
	10-6-56	9-29-56	10-8-55
Pennsylvania Grade	2,490	2,549	3,278
Other Appalachian	2,529	2,552	1,970
Illinois, Indiana, Michigan	11,373	11,352	9,463
Nebraska, North Dakota	2,003	2,204	2,341
Kansas	10,000	10,206	7,890
Oklahoma	24,903	25,840	20,903
Arkansas	2,812	2,824	2,667
Louisiana	18,123	17,532	16,341
North	2,417	2,561	2,734
South	15,706	14,971	13,607
Mississippi	2,948	3,030	3,180
New Mexico	8,439	8,595	7,409
Texas	124,675	125,115	119,823
East Texas proper	9,042	8,980	9,500
West Texas	60,505	60,914	56,742
Texas Gulf	23,261	23,644	24,267
Other Texas	31,867	31,577	29,314
Wyoming	17,165	17,095	14,062
Other Rocky Mountain	6,249	6,188	5,265
California	28,125	27,276	27,598
Foreign	†15,133	16,298	12,796
Total	276,967	278,656	254,986

*Bureau of Mines. †Includes 4,296,000 bbl. in California.

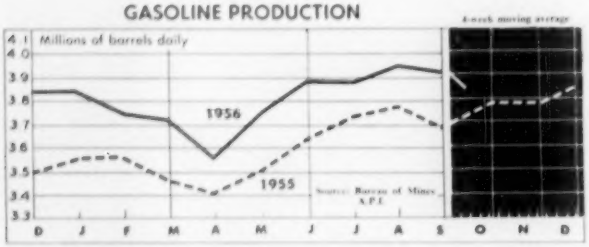
REFINERY RUNS



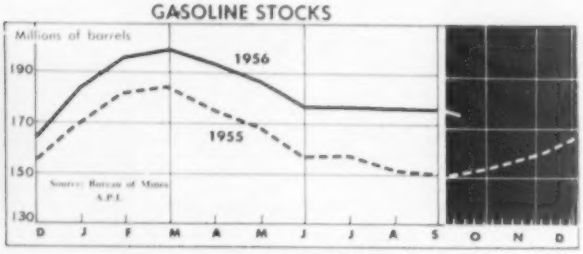
FOUR-PRODUCT STOCKS



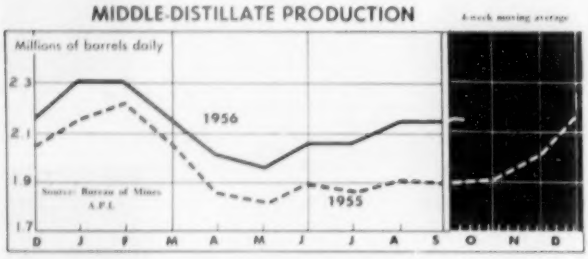
GASOLINE PRODUCTION



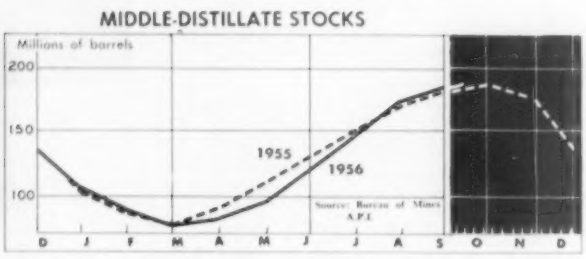
GASOLINE STOCKS



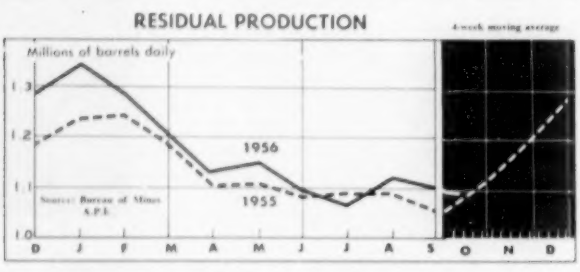
MIDDLE-DISTILLATE PRODUCTION



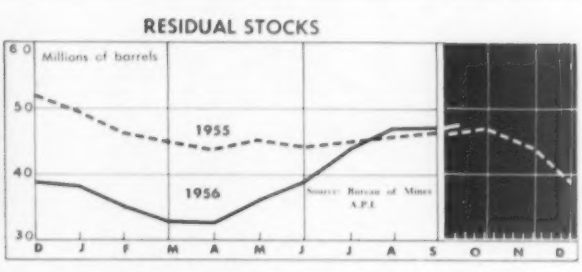
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, OCTOBER 12, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1955: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,040	477.6	39.0	296.9	186.7	43,140	12,944	56,224	11,976	1,054	452.1	31.9	254.5	201.8
Appalachian:														
District 1	96	39.6	5.9	20.4	4.0	4,556	550	3,328	419	100	42.0	4.7	19.7	7.1
District 2	104	42.1	6.9	14.0	13.4	2,884	725	961	420	98	48.2	5.4	12.4	13.5
Ind., Ill., Ky.	1,422	709.7	70.0	281.9	172.0	31,209	7,471	24,109	5,806	1,357	754.7	57.9	258.0	177.1
Minn., Wis., Dak.	59	26.9	1.4	19.0	3.7	6,139	1,758	8,192	132	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	623	359.3	5.9	151.0	26.7	14,721	1,836	13,814	1,456	656	391.1	12.2	163.0	19.4
Inland Texas	246	201.0	6.7	51.9	24.3	7,287	597	2,095	1,775	243	192.8	8.7	49.6	23.2
Texas Gulf Coast	1,779	896.7	117.0	484.7	255.7	23,892	3,672	17,572	6,995	1,813	866.5	113.0	450.9	230.7
La. Gulf Coast	668	335.7	66.9	189.1	36.1	9,643	2,172	7,615	1,557	684	349.3	58.8	162.0	43.2
N. La. and Ark.	103	39.0	9.1	21.1	5.4	4,056	997	2,184	268	90	33.3	7.9	22.1	6.2
Rocky Mountain:														
New Mexico	23	12.6	0.3	4.4	2.9	480	12	104	49	22	11.7	0.4	4.0	2.9
Other Rocky Mtn.	264	110.8	2.1	64.6	29.7	4,895	475	3,234	847	240	115.4	2.6	58.2	36.7
California	1,071	521.1	0.7	172.7	338.3	21,160	355	13,767	15,649	1,108	508.8	5.1	158.0	361.5
Oct. 12, 1956	7,498	3,772.1	331.9	1,771.7	1,098.9	174,062	33,564	153,199	47,349	7,465	3,765.9	308.6	1,612.4	1,123.3
Oct. 5, 1956	7,697	3,812.4	299.4	1,895.4	1,102.6	176,000	33,243	151,805	47,299					
Oct. 14, 1955	7,357	3,652.1	294.1	1,556.7	1,091.3	150,480	37,228	148,849	47,288					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, and Kentucky.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (88 octane)	11.00-11.50
★ Premium (96 octane)	12.75-13.25
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California—Los Angeles (rack):	
Regular (84 octane)	12.1-12.6
Premium (93 octane)	13.35
Premium (96 octane)	14.3-14.6
Caribbean area (cargoes):	
★ Regular (87 octane)	10.00
★ Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	5.0
Breckenridge:	
Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.00-10.25
★ Diesel oil (58 d.i. and above)	9.75-10.00
Distillate No. 1	9.625-9.875
★ Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	9.5
Distillate No. 2	8.75
New York Harbor (barges):	
Kerosine 41-43	11.25
Distillate No. 2	10.65
Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	8.75

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$2.05-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39*	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	$2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC+60%)	$4.56
★ Gulf-U.S.N.H., dirty (USMC+60%)	4.56
★ N.W.I.-U.S.N.H., dirty (USMC+57.5%)	4.25
★ P.G.-U.K., dirty (Scale+145%) (132s. 6d.)	18.46
Lebanon-France, dirty (USMC+57.5%)	8.58

CLASSIFIED —ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

UNDISPLAYED CLASSIFIED 25c a word one issue. 10% Discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$18.00 a column inch one issue
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FOR SALE: 500 KW power plant driven with 3 Worthington gas engines located at Mt. Pleasant, Texas, price $10,000. Contact American Liberty Oil Co. Engineering Department, Box 1011, Mt. Pleasant, Texas.

41,000 FEET 4½" O.D. New Seamless Pipe weight 15.20 per foot 1035 steel High Pressure located Sherman, Texas. Price reasonable. Also good used seamless 5½", 7", 8", 10" casing and tubing, also good used line pipe various sizes. Lun-Dow Company, Box 1215, Tulsa, Phone LU 5-8850

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

STORAGE TANKS
IMMEDIATELY AVAILABLE

QUAN.	BBL. CAP.	QUAN.	BBL. CAP.
1	100,000	18	1,800
7	80,000	2	1,750
10	55,000	4	1,500
3	20,000	6	1,000
12	10,000	2	650
10	5,000	2	500
1	2,500	1	420

Heat & Power Co., Inc.
P. O. BOX 587 DRUMRIGHT, OKLA.
PHONE: Drumright 569

LIQUIDATING

PURE OIL REF., CHARLESTON, W. VA. AND BAY REF., McPHERSON, KANSAS

TWO MODERN and COMPLETE REFINERIES

All equipment and machinery for sale at fraction of original cost.

WRITE FOR CATALOGUE

BROWN-STRAUSS CORPORATION
1548 Guinotte Ave., Kansas City, Mo.
Phone HA 1-1000

Field Office: Cabin Creek (suburb of Charleston, W. Va.)

Phone East Bank 5611. Roy Crisp, Mgr. P. O. Box 2921, Charleston, W. Va.

FOR SALE EQUIPMENT

U-15 DRAWWORKS, Ser. #458, with three NKU Waukesha engines and dual 13" Hydromatic Brake. Drawworks five years old. IVERSON SUPPLY COMPANY, Kermit, Texas. Phone 3491.

CARDWELL 1459K two drum Model R Spudder with 55 ft. new single leg mast on skids with roof and walks. Price $11,000.00 F.O.B., Wichita, Kansas, Cardwell Investment Company, Inc., 604 Petroleum Building.

MODEL U-15 UNIT RIG complete with L. C. Moore double jackknife derrick, 3508' new and 3200' used 4½" drill pipe, 19 drill collars. Rig and motors in A-1 condition. W. D. Kelley Drilling Co., 409 Combs-Worley Bldg., Pampa, Texas.

FOR SALE—At our Tallant, Oklahoma Chemical Plant, two used 12" x 7" x 12" Worthington outside plunger packed duplex steam pumps, serial No. 111224, and D111150, 168 GPM, 200# steam at 350° F., each $350.00. Used for preheated water to boilers. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE EQUIPMENT

IMMEDIATE DELIVERY: 5000 feet; 5½" OD grade J-55 8-RT Spang smls casing; 6500 feet; 2⅜" OD grade J-55 8-RT Spang smls EUE tubing. F.O.B. Sterling, Colo. Phone LA—2-3696, Sterling, Colo.

STAR 83 SPECIAL Spudder with or without tools, excellent condition. Lundquist Pipe and Supply Co., Wright Bldg., Tulsa, Okla.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE—At our Wichita Gasolene Plant, three 5½" x 8" Goulds Fig. 1671 vertical triplex pumps, 120 GPM, 425# WP, used for pumping oil over towers. Price each $500.00. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

LIQUIDATION!

NEAR LONGVIEW, TEXAS

COMPLETE POLY UNIT, BUILT 1958
UOP RATED 144 BBL./DAY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
6—Brown fintube exchangers, 300# 140 sq. ft. 4-6 chrome.
1—5' x 96' tower, 40 tray, 135# WP.
1—6' x 34' Vacuum tower, 150#.
1—2' x 50' tower, 24 trays.
5—Welded tanks, 10' x 40', 10' x 30', 5' x 20'.
1—Ethyl lead plant.
2—Convection furnaces, 20 MIL BTU/hr.
12—Welded storage tanks, 5,000, 2,000, 1,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18; 6 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
4—Steel Bldgs., 20 x 20, 20 x 40.
1—BS&B O&G separator, 10.7 mcf/day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

HOT-OIL PUMPS
3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' HD.

IN STOCK

HEAT EXCHANGERS

10—Kellogg Adm. Flg. Hd. 2700, 2200, 1800 Sq. Ft.
6—Kellogg Steel Flg. Hd. 1500, 800, 500 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp
2 Clark RA-5 500 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

MISCELLANEOUS

6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
6—Adm. 785, 742, 425 sq. ft. ht. exch.
30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
9—3' x 10' 410 SS Sheets.
Tremendous selection stainless steel and steel valves ½"-6".
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.
Goulds 16" pump, 10500 gpm, 135' hd.

PARTIAL LIST ONLY

WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, JA 6-1351
or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE EQUIPMENT

ONE HYDRAULIC casing pulling unit complete. Call GLadstone 3-6561, Great Bend, Kansas.

127' TYPE B OIL WELL Jackknife Derrick with five-sheave crown, 16' x 42' x 24' Split Type Sub-Structure, steel flooring. Price, $7,500. IVERSON SUPPLY COMPANY, Kermit, Texas. Phone 3491.

FOR SALE: Cable-tool Rigs, Complete with Tools: 2—R. L. Cardwell Double Drum Rigs. 1—Walker-Neer S-33 Special. Priced to sell separately or together. Todd Aaron Drilling Corporation, 305 W. Illinois, Midland, Texas. Ph. MUtual 4-8663.

COOPER-BESSEMER, Model GAW, 150 HP, 12½ x 15, 2 Cylinder, 325 RPM, new in 1946, used very little, guaranteed, belted to 100 KW Generator with Switchboard. Will sell less Generator. Le Roi Model L 3460, 600 HP, 12 cylinder, 1200 RPM, connected to 250 KW 440V Generator, mounted on skids with radiator and switchboard. Caterpillar D-17000 with 100 KW Generator. Caterpillar D-13000 with 75 KW Generator. Have over 100 Engine Generator Sets in stock. Let us quote you on your needs. H & H Equipment Company, 326 South Rock Island, Dallas, Texas. RI-6086.

Stop Tong Breakage!

ARMITE DRILL COLLAR & TOOL JOINT COMPOUND

ARMITE LABS., 6609 Broad St., Los Angeles 1, Calif.
Petro. Industries Consultants, C.A. Caracas, Venez.

STEEL PIPE & TUBING

• CHROME MOLY • CARBON MOLY
• MONEL • CARBON STEEL • STAINLESS

Widest Range of Sizes & Specs in the U. S.
WRITE FOR STOCK LIST

MIDCONTINENT TUBE SERVICE, INC.
2308 Oakton St., Evanston, Ill. OA 8-4030

NOW AVAILABLE

10" (10¾" O.D.)
GOOD USED RECESSED LINE PIPE COUPLINGS

Limited Quantity
First Come — First Served
Call "Collect"

CHESTER REICHERT
PRospect 6-1809 (Day)
PRospect 2-4844 (Nite)
St. Louis Missouri

FOR SALE

OIL WELL CASING & TUBING (BRAND NEW)

36,000' 4½" OD 9.5# 8RD T&C
25,000' 4½" OD 11# 8RD T&C
5½", 7", 9⅝", and 13⅜" OD casing also available.

50,000' 2⅜" OD 4.6# New E.W. Non Upset 10RD T&C 3000 PSI Range 1.
35,000' 2⅜" OD 4.7# New E.W. EUE 8RD T&C 3000 PSI Range 1.

Prompt Shipment From Stock

For Prices Wire or Phone:

A. J. Strubel
4946 MURDOCH
ST. LOUIS 9, MO.
OFF.: PRospect 2-2100
RES.: FLanders 1-8152

FOR SALE EQUIPMENT

FOR SALE, Bucyrus-Erie 24L, the E. machine, complete with all tools and equipment. Located at Sanford Trucking Yard, Robinson, Illinois. John F. Butler, Box 87, Dunkirk, Indiana.

TWO 400 H.P. RA-4 Clark angle gas compressors, now running, auxiliary equipment and spare parts. Units less than seven years old. Alfred B. Kern, 305 Kennedy Bldg., Tulsa, Oklahoma.

FOR SALE OR TRADE: 131 ft. Heavy Duty Lee C. Moore Derrick with 18 ft. leg span, 9 ft. boxed substructure, 3 ft. wing extension, front ramp walks, pipe racks, slide rails for derrick, two catline sheave, 5 sheave crown block, serial T 2285, would trade for smaller derrick. Contact FOrest 3-4211, Wichita, Kansas.

FOR SALE EQUIPMENT

ELI DRILL M6D-160D on 1953 Ford F-750 Combination air and 4½ x 5 GD Pump. Excellent Condition, $10,000. ELI Drill M6T3-209 on 1952 2½ Ton Dodge, 6x6 Wheatley Pump. Excellent Condition, $7,500. Drills may be seen at 61st Street and Elwood, Tulsa, Oklahoma. SeisDrill, Inc., 515 Thompson Bldg., Tulsa, Oklahoma.

1 EC CARDWELL DRAWWORKS with practically new 2 engine chain compound. Drum has new flanges and brake lining and new 1¼ Lebus groove. 4 speed transmission completely overhauled. Air control on drum & rotary. Foster spinning cathead. Skids for 2 WAK Waukesha engines. This drawworks located at Drilco Shop, Snyder, Texas. Price $3500.00. Claude J. Thompson, Inc., 1365 Leggett Drive, Abilene, Texas, Telephone ORchard 3-3203.

EQUIPMENT FOR SALE

8" x 20" Model "FXL" Gardner-Denver Mud Pump complete with Suction, Vibrator Hose and Drive Sheave. Excellent condition. Sell or trade for smaller pump.
5" x 10" Model D-50 National Pump, Mud Fitted and powered by 145GK Waukesha Engine with ICK Starting Engine mounted on steel skids. Like new condition.
Model "W" Fred E. Cooper 3000' Pulling Unit with 5" x 7" x 50' Single Pole. Mounted on Spencer Single Axle Float Trailer. Has new Vacuum Ground Controls.
Spencer 38' Tandem Axle Rig Trailer with 10:00 x 20" Tires and Air Brakes complete with folding floors and guard rails. A National Rig has been mounted on this trailer. Like new condition.
Model "S" Cardwell Single Drum Drawworks. Complete with all Air Friction Clutches. Friction Catheads, Grooved Drum and Powered by 6 WAK Waukesha Engine. Excellent Condition.
Model R. L. Cardwell Double Drum Rotary Drawworks. Complete with Mechanical Friction Clutches and Powered by 6 WAK Waukesha Engines. Excellent condition.
Wilson "Giant" Model Rotary Drawworks less engines and compound in good repair. Sell or trade.
Traveling Blocks, block and B. J. Hook Combinations, Tongs, Production Equipment and many other items.

CONTACT

JOHN C. BURGE, INC.

2800 So. High, P. O. Box 4356
Oklahoma City, Oklahoma
Phone ME 7-3358

We will be located in our new yard at 5000 So. Bryan after October 20, 1956.

LIQUIDATION

TIDEWATER OIL REFINERY

DRUMRIGHT, OKLA.

MODERN—COMPLETE 15,000 BBL. PER DAY PLANT

Some of Equipment Highlights:

- Houdriflow Catalytic Cracking Unit (Installed new in 1952)
- Vacuum Crude Oil Distillation Unit (Installed new in 1953)
- 2,500,000 bbl. Storage Tanks from 500 to 100,000 bbls.
- Ethyl Blending Plant
- 10,000 bbl. Hortonsphere
- Polymerization Plant
- 5,000 ton Pipe, Valves & Fittings
- (15) Structural Steel Buildings
- Loading Racks
- Cooling Towers
- Machine Shop
- Warehouse Supplies

(CATALOG BEING PREPARED — WRITE FOR COPY)

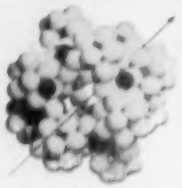
HEAT & POWER CO., INC.

New York Office
60 East 42 St.
New York 17, N. Y.
Murray Hill 7-5280

Drumright Office
P. O. Box 587
Drumright, Okla.
Phone: 569

Tulsa Office
310 Thompson Bldg.
Tulsa 3, Okla.
Diamond 3-4890

FOR SALE EQUIPMENT



REFINING PROCESSES

based on

ADSORPTION

made possible with

MOLECULAR SIEVES

—upgrading of gasoline
—drying and sweetening of natural gas
—recovery of olefins

We need experienced PETROLEUM CHEMISTS and CHEMICAL ENGINEERS to put the unique properties of Molecular Sieves to work in the Petroleum Industry.

Promising fixed and moving bed cycles under development both in adsorption and catalysis.

Submit resume including education (approximate academic standing), experience and background to:

LINDE AIR PRODUCTS COMPANY

A Division of

UNION CARBIDE AND CARBON CORPORATION

P. O. Box 44, Tonawanda, New York

Attention: Mr. R. P. Kolle. Refer To Ad: OGJ-PC

CARDWELL, MODEL "S", double drum with WAK Waukesha, 87 foot Moore mast, folding platform, substructure; Emsco 7½ x 14 pump with two WAK Waukesha; rotary, block, hook, kelly, swivel, BOP, light plants, tool house, bunk house, miscellaneous equipment. Box 3246, Corpus Christi, Texas.

NEW PIPE FOR SALE—Immediate Delivery 38 jts.—1141 ft. Black Seamless Steel Casing—5 O.D. Low Price—Near Poplar Bluff, Mo. Glen C. Bull, 2800 Quebec St., NW, Washington 8, D. C. Phone EM 3-5758.

---

2 GENERATORS, 156 KVA 125KW 3 Ph. 60 cy. 480 volt 900 RPM, Electric Manufacturing Co., complete with engines. Will sell or trade. Woodford Supply Company, 1420 E. Reno, Oklahoma City, Oklahoma. Phone FO 5-1454.

---

2 PUMPING UNITS, long stroke Parkersburg type 11AK, peak torque 434,000, complete with 50 hp engines and engine houses. Will sell or trade. Woodford Supply Company, 1420 E. Reno, Oklahoma City, Oklahoma. Phone FO 5-1454.

U-15 RIG COMPLETE, excellent, near Denver. 7000' new 4½" drill pipe, etc. Take smaller rig. Bargain, terms. Keith Morton, Conrad, Montana.

EQUIPMENT WANTED

SCINTILLATION COUNTER WANTED: Having one or more large crystals, either purchase or rent. Box J-777, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY Complete Vacuum Unit with daily charge capacity of approximately 1,500 bbls. Box 31, Chanute, Kansas.

WILL BUY FOR CASH—One complete Slim Hole Portable Drilling Rig, Diesel Power, capable of drilling slim hole to 8,000 ft. Prefer location Northern United States with equipment winterized. Box J-746, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED TO PURCHASE

50 to 1000 10" 8V Tapered thread line pipe couplings. Advise price and condition.

HANSON'S PUMP AND MACHINE WORKS, INC.

2310 W. McDowell Rd., Phoenix, Ariz.

HELP WANTED

DITCHER SALES Promotion Manager Wanted: Experienced man to head sales promotional activity of leading manufacturer of expanding ditcher line. Must have sales experience and be familiar with design and application of both wheel and boom type machines. Position involves overall sales management responsibilities with distributors and key customer contacts. Age preferably under 45. Management level compensation. Provide complete experience resume with application. Reply to: Personnel Director, Barber-Greene Company, Aurora, Illinois.

HELP WANTED

HYDRAULIC CASING pulling unit operators and helpers. Call GLadstone 3-6551, Great Bend, Kansas.

EXPERIENCED Chemical, Mechanical, Petroleum, or Natural Gas Engineers needed. Experience with gasoline plant design, operation, and maintenance desirable. Dallas headquarters with limited traveling to gasoline plants. If interested, write or wire The Atlantic Refining Company, P. O. Box 2819, Dallas, Texas.

PETROLEUM ENGINEERS

(South America)

Graduate Engineers with experience in drilling, production, reservoir and equipment.

Good opportunities. Liberal employe benefit plans. Salary commensurate with experience and qualifications. Knowledge of Spanish desirable but not essential.

Forward complete resumé of education and experience to

The Texas Company

FOREIGN PRODUCING DEPT.
BOX 2332
HOUSTON 1, TEXAS

ELECTRONIC ENGINEER

Immediate opening for recent college graduate, preferably with some experience in design and application of electronic equipment. Objective is the application of automation and remote control to present pipe line and distribution facilities, and the design, cost estimates, and installation of new facilities.

Progressive company, located in Southwest, providing liberal stock plan, retirement plan, group hospital and life insurance plan and other attractive benefits. Send resumé of education, experience, and salary requirements to

Box J-775,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla., GI 7-5974, Tom Robinson, owner. For graduate, experienced engineers under 35.

WANTED: Recently graduated electrical, civil or mechanical engineer or engineer with a few years experience needed for office and field work in pipe line division of major oil company in Middle West. Please state age, experience and educational qualifications. Box J-772, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESSING ENGINEER: Outstanding opportunity for qualified man to assume processing engineering of moderate size complete refinery. Must have proven supervisory ability and experience with modern processing, organization and economics necessary. Preferred age 35-45. Company is stable and aggressive with unusually good prospects. Location in developing area with agreeable living conditions. Salary and other terms of employment offer a highly profitable career to right man. Must have college education and at least ten years' experience in latest type refining units. All replies will be held confidential and no obligation will be incurred by applicant. For full particulars write to Box J-763, The Oil and Gas Journal, Tulsa, Oklahoma.

VALUATION ENGINEER

Petroleum Engineer with experience in appraisal and reservoir work wanted by permanently established independent oil company. Position requires practical as well as technical knowledge in the evaluation and financing of producing property purchases, and in administrative procedure. Must have the ability and initiative to develop necessary contacts in the active regions of the oil country. Reply should state age, education, experience, active references, and starting salary required.

BOX J-890,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

CHEMICAL ENGINEERS COME SOUTH

Major Oil Company has openings for Chemical Engineers in several phases of process engineering. Locations near New Orleans and south Arkansas, in booming industrial areas where climate and natural advantages make living more enjoyable for all the family. Attractive salary and benefits program. In reply give age, education, experience and salary expected.

PAN-AM SOUTHERN CORPORATION,
P. O. BOX 2,
NEW ORLEANS 6, LOUISIANA

PARTY CHIEFS
SEISMOLOGISTS
COMPUTERS
OBSERVERS

WORLD-WIDE SEISMOGRAPH CONTRACTING ORGANIZATION

offers technical careers to qualified experienced applicants. Highly attractive starting salaries with good opportunities for advancement within both domestic and foreign areas.

United Geophysical Corporation

POST OFFICE BOX "M"
PASADENA, CALIFORNIA

HELP WANTED

NATURAL GAS ENGINEER with engineering degree plus experience in plant design or operation. Location Tulsa. Amerada Petroleum Corporation, Gas Department P. O. Box 2040, Tulsa, Oklahoma.

PETROLEUM ENGINEER with about two years experience wanted by major oil company for training in oil reserve and valuation work. Permanent Tulsa location with opportunity for advancement. Replies should furnish complete personal data, education, experience and salary requirements. Box J-765, The Oil and Gas Journal, Tulsa, Oklahoma.

OPERATIONS ENGINEER

Growing independent oil company wants petroleum engineer with three to six years of practical, technical, and administrative experience for position in operations planning and control section. Some knowledge of valuation work and oil and gas law would also be helpful. Reply should furnish details on education, experience, and references, and state age and required starting salary.

BOX J-784,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

ENGINEERS

Are you worth up to

$10,000 A YEAR?

Important permanent positions, paying from $6,500 to $10,000 a year with unusual future opportunity, have been created by the expansion program of our large, long-established engineering and construction firm. We need qualified engineers, designers and draftsmen experienced in structural, concrete, mechanical and piping design. Engineering offices are in several major American cities and Canada. Excellent working conditions. Generous company benefits. Our employees know of this ad.

Investigate this opportunity. Write today, giving age, education and experience. Your inquiry will be kept strictly confidential and will be answered promptly.

Box J-739,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Experienced graduate engineers for immediate openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

RESERVOIR FLUID ANALYST

With degree in Physical Chemistry or Chemical Engineering plus 5 years' petroleum production engineering experience which should include 2 years' study of reservoir fluid behavior.

Salaries commensurate with training and experience. Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 116

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, N. Y.

HELP WANTED

CHEMICAL ENGINEER for Independent Natural Gasoline Company located in the Permian Basin of West Texas. Prefer recent graduate with BS in chemical engineering, experience not necessary. Reply to Box J-769, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

PRODUCTION ENGINEER—For responsible position with large Independent Company operating primarily in Kansas and Oklahoma. Five to ten years experience to qualify. State qualifications and give salary requirements. Box J-747, The Oil and Gas Journal, Tulsa, Oklahoma.

Graduate Petroleum Engineers with 2 years or more experience wanted by the Production Department of a major oil company. Openings available in Rocky Mountain and Mid-Continent areas. In first reply please give resume of experience and date available.

Box J-753, The Oil and Gas Journal,
Tulsa, Oklahoma.

WANTED

Well-established and aggressive geophysical company, with excellent growth potential, has immediate opening for Ph.D., preferable with geophysics major and under 40.

Applicants must have proven ability to make technical sales contacts, and must be willing to travel.

This is an unusual opportunity for a capable man looking for permanency, above-average earnings, and advancement commensurate with ability.

Qualified candidates are invited to furnish full details of education and experience, recent photograph, and telephone number for arranging confidential interview.

BOX J-779,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

BECHTEL

SAN FRANCISCO CALIFORNIA

Offers engineers liberal relocation allowances from the point of employment to the engineering office in San Francisco. These allowances include transportation for you and your family plus moving allowances for your household furnishings.

PIPELINE ENGINEERS

SENIOR ELECTRICAL
SENIOR MECHANICAL

San Francisco opportunity for senior electrical or mechanical engineers with experience on oil pipeline and pumping stations or gas pipeline and compressor stations.

Send resume to Manager of Employment & Placement
Industrial Relations Division

BECHTEL CORPORATION

220 Bush Street
San Francisco 4, Calif.

For an immediate personal interview you may phone:

Paul Keating, PLaza 7-4400, New York City
Joe Braddick, FAirfax 3-2401, Houston, Texas
Bill Milligan, TUcker 1549, Los Angeles, Calif.
Don Palmer, DOuglas 2-4032, San Francisco, Calif.

HELP WANTED

RESERVOIR ENGINEER: Two to Three years experience. Work to include reserves, evaluations and water flood studies. Substantial independent company. Location Tulsa. Write Box J-766, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION ENGINEER

Experienced or interested in cathodic protection of bare and coated pipelines. Immediate location in Indiana or Ohio. Salary commensurate with training and experience. Outstanding benefit programs. Unusual opportunities for well-qualified men. Give full particulars regarding education, experience, salary requirements and photograph. Replies held in strictest confidence. Write to

WILLIAM H. WEBER

Sohio Pipe Line Company

7438 Forsyth
St. Louis 5, Missouri

PETROLEUM ENGINEERS

Major Oil Company has openings in Production Dept. in Venezuela for a number of graduate petroleum engineers.

OPENINGS also for petroleum, mechanical and chemical engineers for work in drilling, pipeline and gas depts. Salary commensurate with experience.

Please send details of Experience to:
P. O. BOX NO. 35
BOWLING GREEN STATION
NEW YORK 4, N. Y.

HELP WANTED

ENGINEERS WANTED—Oil well drilling tool manufacturer has opening for Design or Field Engineers familiar with rock bits. Should have technical education with some experience preferred. Excellent opportunity in an expanding Engineering Department. Write giving details of education and previous experience to Chicago Pneumatic Tool Company, Box 1990, Fort Worth, Texas.

SALES REPRESENTATIVE. Oil field drills and equipment. Must have broad knowledge of petroleum exploration and oil field drilling equipment. Oklahoma, Kansas, Arkansas and Texas Panhandle territory. Salary plus bonus and expenses. Write Box J-742, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS

Chemical, Mechanical, Petroleum, Gas Engineering Graduates. Our company will interview applicants for openings in our natural gas-gasoline department in Mid-Continent, Louisiana, Gulf Coast areas. Two years minimum design and/or operation experience. Salary to suit qualifications. Our employees are aware of this ad. Box J-721, The Oil and Gas Journal, Tulsa, Oklahoma.

OPPORTUNITY

Supervisory research opening in Lion Oil, A Division of Monsanto Chemical Company for qualified person with at least 5 years experience in the formulation of petroleum specialties. Refining experience desirable but not essential. Location in El Dorado, Arkansas. Integrated refinery operations of moderate size. Real opportunity for advancement.

Address replies to:

E. R. COLEY

Technical Recruitment Coordinator
Lion Oil Company, A Division of
Monsanto Chemical Company
El Dorado, Arkansas

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

CHIEF CHEMIST with at least six years refinery experience. Must be aggressive and have some asphalt experience, for an 18,000 BPD Independent Texas Refinery. Also Chemist with at least three years experience to handle gasoline research as well as other light oil products. Apply Box J-776, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

WANTED—Position as Purchasing Agent. Prefer oil company in Dallas. Fifteen years oil company experience. Will furnish references. Box J-771, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, M.S., Currently engaged in Oil Property Evaluations, extensive secondary recovery and reservoir background, seeks responsible position in Mid-Continent or Rocky Mountain regions. Box J-774, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MANAGER or Superintendent: For complete refinery operations, also to lubricants, oils, waxes, asphalts, seeks management operations position. Experienced Chemical Engineer, in refinery processings; degree, registered. Economics, good leadership, foreign or domestic. Top references. Box J-762, The Oil and Gas Journal, Tulsa, Oklahoma.

COLUMNAR PADS—WORK SHEETS

DESIGNED FOR YOU!—Over 400 styles, sizes and kinds from which to choose. Sheets with 1 to 30 columns. Also horizontally-ruled sheets with no columns. Choice of Kraftbilt Green-Tint, Ivory, Canary or White Paper. Variety of sizes from 8½ x 11 to 14 x 25½ inches. Screened lines guide you without dominating entries. Ask for Catalog 855-P. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

REAL ESTATE

REFINERY SITE

ST. PAUL, MINNESOTA

200 ACRES with trackage & river frontage. Terrain ideal for any type installation. 8 miles from city limits.

DELTA REALTY, INC.
725 New York Bldg., St. Paul, Minn.

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY

Reports—maps—newsletter
Cable: VOSA, Caracas
Mail: Apartado 3983
M. VanMiddlesworth
Phone: 54 48 82

WANTED

WILL BUY 200 to 3,000 Bbls. settled oil production any place. Box J-778, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL BUY
OIL PRODUCING PROPERTIES
Box J-726,
The Oil and Gas Journal
Tulsa, Oklahoma.

LEGAL

SEALED BIDS will be received until 2:00 P. M., Mountain Standard Time, November 1, 1956, and opened at that time in the Office of the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 320 acres of allotted Indian land located in Township 31 North, Range 45 East, Valley County, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Peck Indian Agency at Poplar, Montana, or telephone, Poplar, 2181.

MAINTENANCE and PLANNING ENGINEERS needed in CARIBBEAN AREA

Attractive staff positions are available with affiliate of STANDARD OIL COMPANY (N.J.) for qualified Mechanical and Industrial Engineering graduates—

MAINTENANCE ENGINEERING—studies, surveys, economics, trouble shooting to improve mechanical work efficiency, new equipment evaluation, standards, mechanical work systems and procedures.

PLANNING ENGINEERING—short, intermediate and long-range planning and follow up of mechanical work force for maintenance and construction work, contract preparation and follow up, coordination of all manpower planning activities.

Liberal salaries, benefit plans and vacation policy.

— WRITE —

Giving age, complete address, marital status, education and details of previous experience to:

Box 308 L, Radio City Station,
New York 19, N. Y.

. . . . MECHANIC . . . .
HEAVY DUTY

MAJOR OIL COMPANY HAS OPENING IN VENEZUELA FOR HEAVY DUTY MECHANIC EXPERIENCED IN OPERATION & MAINTENANCE OF NATURAL GAS OR DIESEL ENGINES OF 800 HP OR BETTER EMPLOYED IN CRUDE OIL PIPELINE SERVICE. AGE TO 40 YEARS.

PLEASE SEND DETAILS OF EXPERIENCE

P. O. BOX #35

BOWLING GREEN STATION
NEW YORK 4, N. Y.

ROYALTIES

HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

SACRIFICE SALE: Water flood equipment, new with 6 wells, tanks, pumps, lines, etc., and 800 acres lease all for $11,500. Near Chanute, Kansas. (Owner) P. O. Box 2, Chanute, Ph. 1215. 1st. come, 1st. served.

CONTACT A. L. BOWLES, Box 947, Ada, Okla., for attractive drilling deal in Seminole Co., Okla., or will drill well selling ¼ to ½ interest.

UTAH. Leases on U. S. lands in areas of leasing and drilling activity. We have the sections selected and file your signed applications for you. 640 acres minimum lease. Read letters from clients who made big profits from our selections. You pay U. S. rents and pay us a service fee. John L. Donahue, 430—16th Street, Denver 2, Colorado. Phone ALpine 5-1087.

North Chaves County, N. M.

One field recommended already important discovery. Other major area to drill. Lease or Royalty interests at low cost in either field offer great potential value. Data on request.

W. J. PETERMAN, Geologist
Exploration 1918-1956 Engineering
Portales New Mexico

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

BUSINESS OPPORTUNITIES

LOOKING FOR OIL WELL items for distribution in West Texas and New Mexico. Personnel qualified in production items for area. Will expand sales force if necessary. Warehousing available in Odessa. Will furnish references. P. O. Box 897, Midland, Texas.

WANT YOU to help me drill for Oil on 80 acres between two pools noted for their big wells. My Map and printed discussion will convince you that this offers a good chance for big production. ¾ interest $4800.00, ½ interest $3200.00, ¼ interest $1600.00, ⅛ interest $800.00, 1/16 interest $400.00 and 1/32 interest $200.00. Write O. A. Sewell, Box 103, Coweta, Oklahoma.

SERVICES

ASPHALT AND Lubricating Oil Consultant.—Refinery design and operations. Development Methods. Lubrication; Specialty Products. Asphalt Technology, Highway Engineering. E. J. Barth, 54 West Street, Northampton, Mass.

OIL FORMS

KRAFTBILT FORMS, designed especially for the oil industry, are popular because they are efficient, economical. For plat sheets, well log strips, columnar pads, all production reporting forms, material transfers, truck reports, all administrative forms, ask for new Catalog 1154-K. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

PRODUCTION WANTED

$30,000,000 TO INVEST in producing Oil Properties. If priced reasonable send full report. TJADEN, Eagle Lake, Texas.

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 1158.38 acres of land in eleven parcels within the known geologic structure of the Salt Creek Field, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before December 5, 1956, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Perry T. Williams, Manager.

ADVERTISERS IN THIS ISSUE

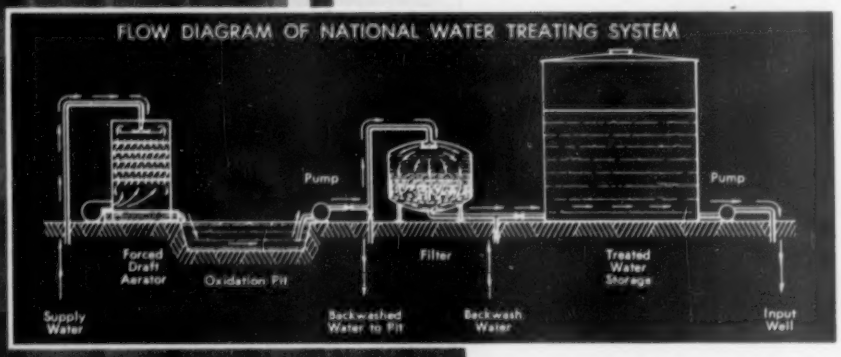
AiResearch Industrial Division, The Garrett Corporation 138
Ajax Iron Works 115
Alco Products, Inc. 40
Allis-Chalmers Mfg. Co. 22
American Iron & Machine Works Co. 15
American Marine Corporation 134
American Steel & Wire Division 187, 188, 189, 190
Anaconda Wire & Cable Company 16
Anchor Petroleum Co. 60
Antara Chemicals A Sales Division of General Aniline & Film Corporation 44
Atlas Powder Company, Aquaness Department 17
B J Service, Inc. 48, 49
Baird Mfg. Co. 158
Baker Oil Tools, Inc. 58
Beech Aircraft Corporation 61
Bendix Aviation Corporation 19
Bethlehem Steel Co. 107
Black, Sivalls & Bryson, Inc. 43
Blair & Co., Inc. 152
Board for Lease of University Lands 51
Bos-co Equip't Eng'r'g & Mfg. 152
BrakeSol, Inc. 134
Cameron Iron Works, Inc. 13
Carbide and Carbon Chemicals Company, A Division of Union Carbide and Carbon Corporation 27
CF&I Tubular Products, The Colorado Fuel and Iron Corporation 12
Classified Advertising 200, 201, 202, 203, 204
Continental Supply Co., The 28, 119, 120
Crose Manufacturing Co., Inc., M. J. 140
Crossett Chemical Company Division of The Crossett Company 52
Dow Chemical Company, The 136
Dowell Incorporated 76, 144
Drilling & Service, Inc. 185
Edward Valves, Inc. 141
Elliott Company 110
Emsco Manufacturing Company 26
Enjay Company, Inc. 139
Fish Engineering Corporation 5
Fluid Packed Pump Company 153, 154
Fluor Products Company A Division of The Fluor Corporation, Ltd. 139
Garrett Corporation, AiResearch Industrial Division 138
General American Transportation Corporation 83
Glitsch & Sons, Inc., Fritz W. 54
Grancell, I. H. 141
Guiberson Corporation 42
Halliburton Oil Well Cementing Co. 11, 123
Harrisburg Steel Co., Division of Harsco Corporation 182
Helicoid Gage Division, American Chain & Cable Co. 47
Hudson Engineering Corporation 90
Hughes Tool Co. Back Cover
International Harvester Co. 173
International Paints (Export) Ltd. 156
Johnston Pump Company 31
Jones & Laughlin Supply Division 30
Kellogg Co., The M. W. 35
Kemp Mfg. Co., C. M. 41
Kinzbach Tool Co., Inc. 183
Klinger Limited, Richard 134
Koppers Company, Inc. 55
Larkin Packer Company, Inc. 150, 151
Leland Equipment Co. 172
Le Roi Division of Westinghouse Air Brake Co. 14
Lone Star Steel Company 46
Lubrication Engineers, Inc. 180
Magnet Cove Barium Corp. 89
Maloney-Crawford Tank & Mfg. Co. 7
Manhattan Rubber Division, Raybestos-Manhattan, Inc. 18
Manning, Maxwell & Moore, Inc. 160
McKee & Co., Arthur G. 23
Mid-Continent Supply Company 36
Midwestern Pipe Line Products Co. 140
Minneapolis-Honeywell Regulator Co., Industrial Division 24, 25
Mission Mfg. Company 108, 109
Moore Corporation, Lee C. 53
Murphy Manufacturer, Frank W. 155
National Airoil Burner Co., The 55
National Aluminate Corp. 75
National Tank Company 206
Nordberg Mfg. Co. 155, 163
Nordstrom Valve Division, Rockwell Manufacturing Company 20, 21
Norris Manufacturer, Inc., W. C. 4
Ohio Injector Company 33
Oil Center Tool Co. 45
Oil and Gas Journal, The 155, 161
OPW Corporation 8
Otis Pressure Control, Inc. 146, 147
Parkersburg Rig & Reel Co. 168
Parsons Company, The Ralph M. 117
Peerless Supply Co., Inc. 140
Petroleum Distributing Co. 158
Pfizer & Co., Inc., Chas. 37
Pittsburgh Steel Company 184, 185
Podbielniak, Inc. 79
Procon Incorporated 148, 149
Raybestos-Manhattan, Inc., Manhattan Rubber Division 18
Refinery Engineering Company 10
Republic Steel Corporation 178, 179
Rockwood Sprinkler Company 159
Ross Heat Exchanger Division of American-Standard 128
Ross-Martin Co. 155
Ryerson & Sons, Inc., Joseph T. 184
Sargent Engineering Corporation 112
Schlumberger Well Surveying Corp. 38, 39
Shand & Jurs Co. 157
Socony Mobil Oil Company, Inc. 156, 167
South Texas College Book Store 155
Spartan Aircraft Company, Industrial Sales Division 36
Taylor Instrument Companies 132
Timken Roller Bearing Company Inside Front Cover
Tube-Kote Incorporated 50, 51
Union Asbestos & Rubber Company 143
Union Carbide and Carbon Corporation, Carbide and Carbon Chemicals Company 27
United States Steel Corporation—American Steel & Wire Division 187, 188, 189, 190
Wilte Engine Works Oil Well Supply Division 6
United Supply & Manufacturing Co. 126
Universal Oil Products Company 32
Victoria Bank & Trust Co. 166
Well Equipment Mfg. Corp. 142
Western Supply Company 9
Willys Motors, Inc. 34
Wilte Engine Works Oil Well Supply Division, United States Steel Corporation 6
Wolverine Tube Division of Calumet & Hecla, Inc. 28, 29
Youngstown Sheet and Tube Company Inside Back Cover

LEGAL

NOTICE—Sale of oil and gas mining leases, tribal and allotted Indian lands. Department of the Interior, Bureau of Indian Affairs, Navajo Indian Agency, Window Rock, Arizona. Sealed bids will be received until 2:00 P. M. Mountain Standard Time and opened at that time in the office of the Navajo Indian Agency, Window Rock, Arizona, on the following tracts of Navajo tribal and allotted lands on the dates indicated as follows: Group 3: Bids to be Opened: 11-1-56: Tracts Nos. 100, 101, 109, 112, 113, 115, 120, 122 and 122 to 180 inclusive, totaling approximately 123,612.57 acres. Group 2: Bids to be Opened: 11-13-56: Tracts Nos. 53, 54, 55, 56, 57, 58, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 93, 94, 95, 96, 97, 98 and 99, totaling approximately 82,200 acres. Group 1: Bids to be Opened: 11-23-56: Tracts Nos. 1, 2, 4, 5, 7, 9, 13A, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 52A, 52B, and 53A to 72A inclusive, totaling approximately 158,505.40 acres. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the General Superintendent of the Navajo Indian Agency, Attention: Branch of Realty, Window Rock, Arizona.

AERATION!

National Aerator for treating supply water or disposal water in open water system.



Two National Aerators in series with water supply well located north of Tulsa, Oklahoma.

A Part of The . . .

NATIONAL "OPEN SYSTEM"

Salt Water Treating

The National forced draft Aerator is fabricated of redwood with reinforced fiber glass distributor and splash trays, to facilitate ease of and reduce frequency of cleaning. Distribution of water from tray to tray assures liberation of water-bound gases which are expelled to the atmosphere by controlling the volume of air introduced at bottom of the Aerator.

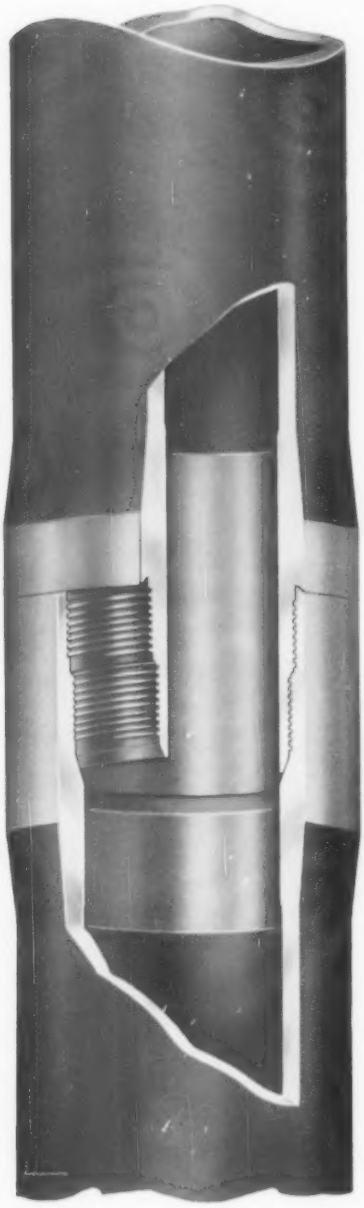
Submerged Aerators are also manufactured by National as are complete closed and open water systems.

Our Engineering Department welcomes inquiries concerning your water disposal problems.

It's National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA



In a Speedtite joint, threads are cut on two diameters. This provides the strongest possible joint cut right into the upset metal. The thread on each step is straight—not tapered—so that its clearance is uniform, allowing for smoother make-up. All Speedtite casing threads of a size are interchangeable, thus eliminating need for cross-over joints.

DEEP DRILLING

demands the best in casing ... and the best available is SPEEDTITE

Yes, Youngstown's Speedtite Oil Well Casing is the modern answer to problems encountered in drilling to greater and greater depths. When field conditions become increasingly difficult, specify Speedtite Casing because it:

- provides the necessary strength and ruggedness to take the increased punishment
- offers faster, safer, more economical setting of long strings
- guards against joint failures
- handles even the most difficult jobs with ease

For satisfactory field performance, Oil Country Tubular Goods must be of the highest quality. Recognizing this fact, Youngstown rigidly quality-controls all steps in its completely integrated operations.

From off-shore drilling sites to the deepest wells in the Southwestern oil fields, Speedtite is busy on the job. Why not let the Youngstown representative show you the many ways Speedtite can increase the efficiency of your operations?

CHECK THESE PRODUCTION ADVANTAGES OF THE *SPEEDTITE* EXTRA-STRENGTH JOINT!

Provides a 100% pressure seal against both internal and external pressures. It's leak-proof up to and beyond the casing's yield point.

Its increased strength over threaded and coupled joints ranges from 30% to 70%. Heavier casing can be run on the bottom of the string and lighter casing on the top—with ample tensile strength in all joints of the string.

A smaller outside diameter provides additional assurance casing will go to bottom. In some fields its smaller OD permits a reduction in hole size—thereby lowering drilling costs.

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities

the "bit line" to your rig...

Every working day, big transport trucks like these load rock bits at our plant warehouse for delivery to more than 150 Hughes field stockpoints throughout the United States and Canada. The final destination — your rig!

In maintaining these ample stocks, Hughes Tool Company's high capacity production lines operate 'round the clock, 'round the year. As a result, the bits available for delivery to your rig are always *right* as to size, type and design for your drilling requirements.